CHEMISTRY

BOOKS - CENGAGE CHEMISTRY (HINGLISH)

STOICHIOMETRY

Solved Examples

1. H_2SO acts as

(i). An acid.

(ii) An oxidising agent

A dehydrating agent

Select equations from rthe following which explain each type

(a) $5H_2SO_4(\text{conc}) + 4Zn \rightarrow 4Zn^{2+} + H_2S + 4SO_4^{2-} + 4H_2O$

(b) $H_2SO_4(\text{dil}) + Zn \rightarrow Zn^{2+} + H_2 + SO_4^{2-}$

(c) $C_6H_{12}O_6 \xrightarrow{H_2SO_4(\text{conc})} 6C + 6H_2O$

(d) $H_2SO_4(\text{dil}) + ZnCO_3 \rightarrow Zn^{2+} + CO_2 + SO_4^{2-} + H_2O.$

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2. (a) $NaBr$ on reaction with conc H_2SO_4 gives SO_2, HBr, and Br_2, whereas $NaCl$ with conc H_2SO_4 gives HCl but no Cl_2 or SO_2 is produced. Explain ?

(b) Which of the following reactions occur ?

(i) $Br_2 + 2NaC < oCl_2 + NaBr$

(ii) $Cl_2 + NaBr \rightarrow Br_2 + 2NaCl$

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3. Which of the following is correct ?

Aqueous solution of $Na_2S_2O_3$ on reaction with Cl_2 gives ?

(a) $Na_2S_4O_6$

(b) $NaHSO_4$

(c) $NaCl$

(d) $NaOH$

(ii) Acidic solution of $Na_2S_2S_2O_3$ on reaction with Cl_2 gives

(a) $Na_2S_4O_6$

(b) $NaHSO_4$

$NaSO_4$

(d) $NaOH$

(iii) Basic solution of $Na_2S_2O_3$ on reaction with Cl_2 gives

(a) $NaOH$

(b) $Na_2S_4O_6$

(c) $Na_2SO_4^{\oplus}$

(d) $NaHSO_4$

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4. Complete and balance the followig equations in basic solution :

$Hg_2(CN)_2 + Ce^{4+} \rightarrow CO_3^{2-} + NO_3^{\ominus} + Hg(OH)_2 + Ce^{3+}$

(a) By considering C in $+4$ oxidation state and N in $+5$ oxidation state.

(b) By considering C in $+4$ oxidation state and N in $+5$ oxidation state

(c) By considering Hg in $+2$ and C in $+4$ oxidation state.

(d) Explain why the same result is obtained regardless of the choice of oxidation state.

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5. Complete and balance the followig equations:

(a) $\left[Fe(CN)_6\right]^{4-} + H^{\oplus} + MnO_4^{\ominus} \rightarrow Fe^{3+} + CO_2 + NO_3^{\ominus} + Mn^{2+}$

(b) $Cu_3P + Cr_2O_7^{2-} \rightarrow Cu^{2+} + H_3PO_4 + Cr^{3+}$

(c) $P_4S_6 + H^{\oplus} + NO_3^{\ominus} \rightarrow NO + H_3PO_4 + SO_2 + H_2O$

(d) $AuCl_4^{\ominus} + Zn \rightarrow Au + Zn^{2+} + ?$

(e) $Zn + \overset{\ominus}{O}H \rightarrow Zn(OH)_4^{2-} + ?.$

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6. Br_2 undergoes disproportionation reaction in basic medium to give $Br^{\ominus}$ ion and $BrO_3^{\ominus}$ (bromate) ion in reduction and oxidation reaction.

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7. P_4 undergoes disproportionation in basic medium to give PH_3 (phosphine) and $H_2PO^{\ominus}$ (dihydrogen hypophoshite ion). Atomic weight of P is 31.

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8. What volume of 01 M $KMnO_4$ is required to oxidise 100 " mL of " 0.2 M $FeSO_4$ in acidic medium ? The reaction involved is

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9. What volume of 0.2 M $K_2Cr_2O_7$ is required to oxidise 50 " mL of " $0.3M$ $Na_2C_2O_4$ in acidic medium?

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10. 5 mL solution of H_2O_2 liberates 1.27 g of iodine from an acidified KI solution. What is the molarity of H_2O_2?

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11. How many moles of $KMnO_4$ will be required to react completely with 1 " mol of "$K_2C_2O_4$ (potassium oxalate) in acidic medium?

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12. How many moles of H_2O_2 will be requried to react completely with 1.5 " mol of "$K\left[Cr(OH)_4\right]$ (potassium tetrahydroxochromate (I)) in basic medium?

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13. What volume of 0.1 M $KMnO_4$ is required to oxidise 100 " mL of " 0.3 FeC_2O_4 (ferrous oxalate) in acidic medium?

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14. How many moles of FeC_2O_4 are required to reduce 2 " mol of " $KMnO_4$ in acidic medium?

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15. 100 " mL of " x M $KMnO_4$ is requried oxidise 200 " mL of " 0.2 M ferric oxalate in acidic medium what is the normality of $KMnO_4$?

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16. What volume of 0.2 N $KMnO_4$ is required to oxidise 10 " mg of " ferrous oxalate in acidic medium? (Molecular Weight of FeC_2O_4 is 144 g)

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17. What volume of 0.1 M $K_2Cr_2O_7$ is required to oxidise 50 " mL of " 0.2 M Cu_2S (cuprous sulphide) in acidic medium to give Cr^{3+}, Cr^{2+}, and $SO_2(g)$?

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18. How many moles of $K_2Cr_2O_7$ all required to react completely with 2.5 " mol of "Cu_2S in acidic medium?

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19. What weight of $KmNO_4$ is required to react completely with $500mL$ of 0.4 M Cus in acidic medium?

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20. Calculate the volume of 0.5 M H_2SO_4 required to dissolve 0.5 g of copper (II) carbonate $(CuCO_3)$.

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21. In a chrome plating plant, CrO_4^{2-} (chromate) ions are present in waste water. The chromate ions are reduced to insoluble chromium hydroxide, $Cr(OH)_3$, by dithionate ion, $S_2O_4^{2-}$ in basic medium.

$CrO_4^{2-} + S_2O_4^{2-} + \overset{\ominus}{O}H + H_2O \rightarrow Cr_2(OH_3) + SO_3^{2-}$ 10 L of water requires 522 g of $Na_2S + 2O_4$. Calculate the normality and molarity of CrO_4^{2-} in waste water. Also express the concentration of Na_2CrO_4 in ppm.

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22. Metalic tin (Sn) is oxidised to its maximum oxidation state by $KMnO_4$ and $K_2Cr_2O_7$ separately in the presence of HCl. Calculate the ratios of

the volumes of decimolar solutions of $KMnO_4$ and $K_2Cr_2O_7$ that would be reduced by 1.0 g of Sn (Atomic weight of $Sn = 118.6$).

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23. Upon heating 1 L of 2 N HCl solution, 36.5 g of HCl is lost and the volume of solution resuces to 800 mL. Calculate . (a). The normality of the resultant solution.

(b). The number of equivalents of HCl in 100 " mL of " the original solution..

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24. How many moles of HgI_4^{2-} will be formed when 2 " mol of "Hg^{2+} and 2 mol $I^{\ominus}$ react according to the following equation?

$Hg^{2+} + 4I^{\ominus} \rightarrow HgI^{2-}$

(a). 1 mol

(b). 0.5 mol

(c). 0.25 mol

(d). 2 mol

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25. 80 " mL of " $KMnO_4$ solution reacts with 3.4 g of $Na_2C_2O_{4.2}H_2O$ in acidic medium. The molarity of the $KMnO_4$ solution is.

(a). 0.5M

(b). 0.1M

(c). 5M

(d). 1M

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26. What weight of $NaHSO_3$ is required to react with 100 " mL of " solution containing 0.33 g of $NaIO_3$ according to the following reaction:

$IO_3^{\ominus} + HSO_3^{\ominus} \rightarrow I^{\ominus} + SO_3^{2-}$

(a). $0.52g$

(b). 5.2 g ltbr) (c). $1.04g$

(d). $10.4g$

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27. KI reacts with H_2SO_4 producing I_2 and H_2S. The volume of 0.2 H_2SO_4 required to produce 3.4g of H_2S is

(a). 2.5 L

(b). 3.8 L

(c). 4 L

(d). 5 L

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28. It requires $40.0mL$ of $0.50MCe^{4+}$ to titrate $10.0mL$ of $1.0MSn^{2+}\text{to}Sn^{4+}$. What is the oxidation state of cerium in the reduced product?

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29. Calculate the weight of $K_2Cr_2O_7$ required to produce from excess oxalic acid $(H_2C_2O_4)$, $8.2L$

CO_2 at 127^2 and 1.0 atm pressure?

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30. 0.5 g $CaBr_2$ was dissolved in water and the solution is acidified with nitric acid, 50 " mL of " standard $0.1N$ $AgNO_3$ is added and the solution is shaken thoroughly, the remaining $Ag^{\oplus}$ ions required 15 " mL of " 0.1 N NH_4CNS solution using ferric alum as the indicator. Calculate the percentage of $CaBr_2$ in the sample.

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31. 6 " mol of "a solution A^{n+} requires 2 " mol of "$Cr_2O_7^{2-}$ ions for the oxidation of A^{n+} to $AO_3^{\ominus}$ in acidic medium the value of n is (a). 1

(b). 2.

(c). 3.

(d). 4.

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32. 50 " mL of " an acidic solution of 0.255 M $K_2Cr_2O_7$, 30 " mL of " 0.4 M $K_2C_2O_4$, and 120 " mL of " 0.2 M Fe^{2+} are added together. Compute the molarities of Fe^{3+} ions and $Cr_2O_7^{2-}$ ions in the final solution.

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33. When 100 " mL of " 0.06 M Fe $(NO_3)_3$, $50mL$ of $0.2MFeCl_3$ and $100mL$ of $0.26M$ Mg $(NO_3)_2$, are mixed In the final solution.....

$[Fe^{3+}] =$ ....

$\left[NO_3^{\ominus}\right] =$ .....

$\left[Cl^{\ominus}\right] =$ .....

$[Mg^{2+}] =$ .....

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34. Calculate the concentration of $K^{\oplus}$ (x) and $Cl^{\ominus}$ (y) in a solution obtained by mixing 20 " mL of " 0.1 M $NaCl$, 30 " mL of " 0.2 M KCl, and 25 " mL of " 0.15 M KNO_3 and making the solution up to 100 mL.

(a). $x = 0.06, y = 0.0375$

(b). $x = 0.0975, y = 0.08$

(c). $x = 0.08, y = 0.08$

(d). $x = 0.08, y = 0.0375$

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35. 250 " mL of " x M solution and 500 " mL of " y M solution of a solute are mixed and diluted to 2L to produce a final concentration of 1.6 M. If $x : y = 5 : 4$, calculate x and y.

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36. What is the normality of a solution that results from mixing 7.4 g of $Ca(OH)_2, 500$ " mL of " $1MHNO_3$ and $10.0mL$ of H_2SO_4 (specific gravity $= 1.2, 49\ \%\ H_2SO_4$ by weight)?

The total volume of the solution was made to 1L after adding water?

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37. How many grams of borax $(Na_2B_4O_{7.10}H_2O)$ are required to neutralise 25 " mL of " 0.2 M HCl and H_2SO_4 separately?

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38. 1.0 g of a metal oxide gave 0.2 g of metal. Calculate the equivalent weight of the metal.

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39. 3.0 g of metal chloride gave 2.0 g of metal. Calculate the equivalent weight of the metal.

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40. 1.0 g of metal nitrate gave 0.86 g of metal sulphate. Calculate the equivalent weight of metal.

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41. Calculate (a) normality (b) molarity (c) strength in gL^{-1} and (d) percentage strength of 10 volume strength of H_2O

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42. Calculate the number of moles and weight of O_2 produced on heating 1.12 L of 10 volume strength of H_2O_2 at STP.

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43. 10 " mL of " H_2O_2 liberates 12.7 g of iodine form an acidic KI solution. Calculate the (a) normality, (b) molarity, (c) volume strength, (d). Strength, and (e) percentage strength of H_2O_2.

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44. A solution of $K_2Cr_2O_7$ containing $4.9gL^{-1}$ is used to titrate H_2O_2 solution containing $3.4gL^{-1}$ in acidic medium. What volume of $K_2Cr_2O_7$ will be required to react with 20 " mL of " H_2O_2 solution? Also calculate the strength of H_2O_2 in terms of available oxygen.

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45. When 100 " mL of " an aqueous solution of H_2O_2 is titrated with an excess of KI solution in dilute H_2SO_4, the liberated I_2 required 50 " mL of

" 0.1 M $Na_2S_2O_3$ solution for complete reaction. Calculate the percentage strength and volume strength of H_2O_2 solution.

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46. Calculate the volume strength of H_2O_2 solution if 50 " mL of " this diluted solution required 40 " mL of " $\frac{M}{60}$ $K_2Cr_2O_7$ solution in presence of H_2SO_4 for complete reaction.

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47. 50 mL of ozone \(O_3) at STP were passed through 50 mL of 5 volume H_2O_2 solution. What is the volume strength of H_2O_2 after the reaction?

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48. 5.1 g sample of H_2O_2 solution containg x % H_2O_2 by weight requires x " mL of " $K_2Cr_2O_7$ solution for complete oxidation under acidic

condition. What is the molarity of $K_2Cr_2O_7$ solution?

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49. 200 " mL of " acidified 3 N H_2O_2 is reacted with $KMnO_4$ solution till there is a light tinge of purple colour. Calculate the volume of O_2 produced at STP.

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50. 0.71 g of a sample of bleaching powder $(CaOCl_2)$ is dissolved in 100 " mL of " water. 50 " mL of " this solution is titrated with KI solution. The I_2 so liberated required 10 mL 0.1 M $Na_2S_2O_3$ (hypo) solution in acidic medium for complete neutralisation. Calculate the percentage of available Cl_2 from the sample of bleaching power.

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51. 0.5 g sample of copper ore is converted into $CuSO_4$ solution. The resulting solution is acidified with dilute CH_3COOH (acetic acid) and excess KI added. The liberated I_2 required 0.248 g $Na_2S_2O_{3.5}H_2O$ for complete reaction. Calculate the percantage of Cu in the ore.

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52. 50.0 g sample of brass is dissolved in 1 L dil $H_2SO_{4.20}mL$ of this solution is mixed with KI, and the liberated I_2 required 20 " mL of " 0.5 M hypo solution for titration calculate the amount of Cu in the alloy.

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53. Mercuric iodate $\left[Hg_5(IO_6)_2\right]$ reacts with a mixutre of KI and HCl according to the following equation.

$Hg_5(IO_6)_2 + 34KI + 24\text{HCl} \rightarrow 5K_2HgI_4 + 8I_2 + 24KCI + 12H_2O$

or $Hg_5(IO_6)_2 + 34I^{\ominus} + 24H^{\oplus} \rightarrow 5HgI_4^{2-} + 8I_2 + 12H_2O$

The liberated I_2 is titrated with $Na_2S_2O_3$ solution. 1.0 " mL of " $Na_2S_2O_3$

is equivalent to 3.992 g of $CuSO_{4.5}H_2O$. What volume (in mL) of the $Na_2S_2O_3$ solution will be required to react with liberated I_2 from $14.485gHg_5(IO_6)_2.[Hg = 200.5, Cu = 63.5, I = 127]$?

$Mw\left(Hg_5(IO_6)_2\right) = 1448.5g$

$Mw(CuSO_{4.5}H_2O) = 249.5g$

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54. 0.5 g of fuming sulphuric acid $(H_2SO_4 + SO_3)$, called oleum, is diluted with water. Thus solution completely neutralised 26.7 " mL of " 0.4 M $NaOH$. Find the percentage of free SO_3 in the sample solution.

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55. 1.84 g of $CaCO_3$ and $MgCO_3$ were treated with $50mL$ of 0.8 HCl solution. Calculate the percentage of $CaCO_3$ and $MgCO_3$.

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56. 5.5 g of a mixutre of $FeSO_{4.7}H_2O$ and $Fe_2(SO_4)_{3.9}H_2O$ requires 5.4 " mL of " $0.1NKMnO_4$ solution for complete oxidation. Calculate the number of gram moles of hydrated ferric sulphate in the mixture.

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57. 0.4 g of a mixutre containing sodium oxalate $(Na_2C_2O_4)$ and potassium oxalate requires 50 " mL of " $\frac{M}{60}K_2Cr_2O_7$ solution in acidic medium for complete reaction. Calculate the percentage composition of the mixture.

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58. 2.1 g of a mixture of $NaHCO_3$ and $KCIO_3$ required 100 " mL of " 0.1 HCl for complete reaction. Calculate the amount of residue that would be obtained on heating 2.2 g of the same mixture strongly.

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59. The composition of a sample of wustite is $Fe_{0.93}O_{1.00}$. What percentage of iron is present in the form of $Fe(III)$?

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60. 1.67 g mixture of Al and Zn was completely dissolved in acid and evolved 1.69 L of H_2 at STP. Calculate the weight Al and Zn in the mixture.

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61. A mixture of FeO and Fe_3O_4 when heated in air to a constant weight, gains 5% of its weight. Find the composition of the initial mixture.

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62. A mixture of $H_2C_2O_4$ and $HCOOH$ is heated with conc H_2SO_4. The gas produced is collected and on treatment with KOH solution, the

volume of the gas decreases by $\frac{1}{6}$ calculate the molar ratio of the two acids in the original mixture.

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63. 2.0 g of mixure of Na_2CO_3, $NaHCO_3$, and NaCl on heating produced 56 " mL of " CO_2 at STP. 1.6g of the same mixture required 25 " mL of " 0.5 M H_2SO_4 for complete neutralisation. Calculate the percentage of each component present in the mixture.

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64. 500 " mL of " 1.0 M $H_2C_2O_4$, 100 " mL of " 2.0 M H_2SO_4, and $40g$ of $NaOH$ are mixed together, 30 " mL of " the above mixture is titrated against a standard solution of sodium carbonate containing 14.3 g of $Na_2CO_{3.10}H_2O$ per 100 " mL of " solution. Find the volume of carbonate solution used for complete neutralisation.

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65. One litre of mixture of O_2 and O_3 at STP was allowed to react with an excess of acidified solution of KI. The iodine liberated required 40 " mL of " $\frac{M}{10}$ sodium thiosulphate solution for titration. What is the mass per cent of ozone in the mixture? Ultraviolet radiation of wavelength 300 nm can decompose ozone. Assuming that one photon can decompose one ozone molecule, how many photons would have been required for complete decomposition of ozone in the original mixture?

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66. 3 L mixture of propane and butane on complete combustion at 298 K gave 10 L CO_2 Calculate the compostion of the gas mixture.

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67. Calculate the percentage composition of a solution obtained by mixing 200 g of a $20\ \%$ and 300 g of a $30\ \%$ solution by weight.

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68. 3.75 g of a mixture of $CaCO_3$ and $MgCO_3$ is dissolved in 1 L of 0.1 M HCl to liberate 0.04 " mol of "CO_2. Calculate

(a). The percentage of each compound in the mixture.

(b). The amound of acid used.

(c). The amound of acid left after the reaction.

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69. 1.5 g of chalk was treated with 10 " mL of " 4 N HCl. The chalk was dissolved and the solution was made to 100 mL. 25 " mL of " this solution required 18.75 mL of 0.2 N NaOH solution for comjplete neutralisation. Calculate the percentage of pure $CaCO_3$ in the sample of chalk.

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70. 10 g of a mixture of Cu_2S and Cus was titrated with 200 " mL of " 0.75 M $MnO_4^{\ominus}$ in acidic medium producing SO_2, Cu^{2+}, and Mn^{2+}. The SO_2 was boiled off and the excess of $MnO_4^{\ominus}$ was titrated with 175 " mL of " $1MFe^{2+}$ solution. Find the percentage of CuS the in original mixture.

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71. Hydroxylamine reduces Fe^{3+} accoeding to the following reaction:

$$2NH_2OH + 4Fe^{3+} \rightarrow H_2O + 4Fe^{2+} + 4H^{\oplus} + N_2O$$

Fe^{2+} produced is is estimated by titration with $KMnO_4$ solution A 10 mL sample of NH_2OH is diluted to 1000 mL. 50 " mL of " this diluted sample is boiled with excess of Fe (III) solution. The resulting solution required 12 " mL of " 0.02 M $KMnO_4$ for complete oxidation. Determine the strength of NH_2OH.

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72. 20 " mL of " $\frac{M}{60}$ $KBrO_3$ was added to a sample of SeO_3^{2-}, The bromine evolved was removed and the excess of $KBrO_3$ was titrated with 5.1 " mL of " $\frac{M}{25}$ solution of $NaAsO_2$. Calculate the amound of SeO_3^{2-} and balance the equation.

$SeO_3^{2-} + BrO_3^{\ominus} + H^{\oplus} \rightarrow SeO_4^{2-} Br_2 + H_2O$

$BrO_3^{\ominus} + AsO_2^{\ominus} + H_2O \rightarrow Br^{\ominus} + AsO_4^{3-} + H^{\oplus}$

$(Br = 80, K = 39, As = 75, Se = 79)$

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73. 30 " mL of " a solution containing $9.15gL^{-1}$

of an oxalate $K_xH_y(C_2O_4)_2.nH_2O$ required for titration 27 " mL of " 0.12 N NaOH and 36 " mL of " 0.12 N $KMnO_4$ for oxidation Find x,y,z. and n.

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74. The neutralisation of a 1.20 g solution of a mixture of $H_2C_2O_{4.2}H_2O$ and $KHC_2O_4.H_2O$ and different impurities of a neutral salt consumed

37.80 " mL of " 0.25 N NaOH solution. On the other hand, on titration with $KMnO_4$ for 0.40 g of the same substance, 43.10 " mL of " 0.125 N $KMnO_4$ was required. Find the percentage composition of the substance being analysed.

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75. An equal volume of reducing agent is titrated separately with $1MKMnO_4$ in acid, neutral and alkaline medium. The volumes of $KMnO_4$ required are $20mL, 33.3mL$ and $100mL$ in acid, neutral and alkaline medium respectively. Find out oxidation state of Mn in each reaction product. Give balance equation. Find the volume of $1MK_2Cr_2O_7$ consumed if same volume of reductant is titrated in acid medium.

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76. A sample of pyrolusite (MnO_2) weighs 0.5 g. To its solution, 0.6674 g of As_2O_3 and dilute, acid are added. After the reaction has ceased,

arsenic $\left(As^{3+}\right)$ in As_2O_3 is titrated with $45mL$ of $\frac{M}{50}$ $KMnO_4$ solution. Calculate the percentage of MnO_2 in pyrolusite. (Atomic weight of As is 74.9 and that of Mn is 55.)

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77. 0.6 g of a sample of pyrolusite was boiled with 200 " mL of " $\frac{N}{10}$ oxalic acid and excess of dilute sulphuric acid. The liquid was filtered and the residue washed. The filtrate and washing were mixed and made up to 500 mL in a measuring flask. 100 " mL of " this solution required 50 " mL of " $\frac{N}{30}KMnO_4$ solution. Calculate the percentage of MnO_2 in the sample $(Mn = 55)$.

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78. 1.5 g of a mixture containing As_2O_5, Na_2HAsO_3, and some inert impurities is dissolved in water, and the solution is kept neutral by adding excess of $NaHCO_3$. The solution when titrated with 0.1 M I_2 required

35.0 nL of it for complete titration. The solution is then acidified and excess of KI is added to it. The I_2 liberated required $35.0mL$ of $0.3MNa_2S_2O_3$ solution for complete titration. Find the percentage composition of the mixture (Atomic mass of As is 75, Na is 23 and O is 16.)

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79. To 100 " mL of " $KMnO_4$ solution containing 0.632 g of $KMnO_4$ 200 " mL of " $SnCl_2$ containing 2.4g is added in presence of HCl. To the resulting solution, an excess of $HgCl_2$ is added at once. How many grams of Hg_2Cl_2 will be precipitated? (molarcular mass of $KMnO_4$ is 158, $SnCl_2$ is 95, and Hg_2Cl_2 is 471 g mol^{-1})

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80. 3.0 g of impure Na_2CO_3 is dissolved in water and the solution is made up to $250mL$. To 50 " mL of " this solution, 50 " mL of " 0.1 N HCL is added and the mixture, after shaking well, required 10 " mL of " 0.16 N

NaOH solution for cojmplete neutralisation. Calculate the percentage purity of the sample of Na_2CO_3.

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81. 10 " mL of " a sample of phenol was diluted with $H_2O$and made up to $1.0L$. 20 " mL of " this solution was treted with 40 mL brominating solution (a mixture of $KBrO_3$ and KBr) in dil H_2SO_4. Excess of KI was added, and the liberated I_2 required 15 " mL of " 0.1 M $Na_2S_2O_3$ for complete reaction. 25 " mL of " the same brominating solution, on similar treatment required, 20 " mL of " 0.1 M $Na_2S_2O_3$. Calculate the weight of phenol per litre of the original sample.

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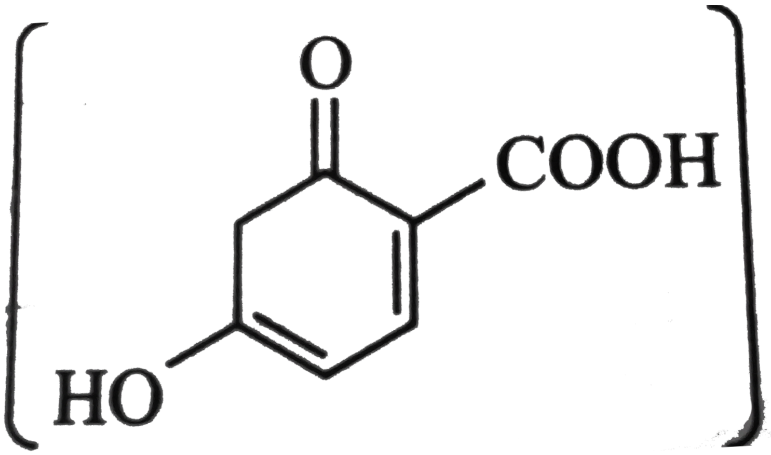
82.



1 " mol of "an organic compound (A) reacts with $NaOH$. How many moles of NaOH are required to react with (A)?

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83. A sample of pure aniline was dissolved in HCl and diluted to 100 mL with H_2O. 20 " mL of " liquid was treated with 25 " mL of " 0.017 M $KBrO_3$ and about 10 g KBr was added to form Br_2. After 10 min, an excess of KI was added and the liberated I_2 was titrated with 12.92 " mL of " 0.12 M $Na_2S_2O_3$. Calculate the weight of aniline taken.

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84. In the reaction of Mohr's salt $\left[FeSO_4(NH_4)_2SO_{4.6}H_2O\right]$ with oxalate ions in the presence of H_2O_2 and $H^{\oplus}$ ions, $\left[Fe(C_2O_4)_3\right]^{3-}$ ion is formed. Calculate the minimum mass of Mohr's salt and $K_2C_2O_4$ required to prepare 10 g of $K_3Fe(C_2O_4)_2$.

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85. Calcium phoshide formed by reacting calcium orthophosphate with Mg was hydrolysed by water. The phosphine evolved was burnt in air to yield P_2O_5. How many litres of air, containg $21\,\%$ by volume of O_2, was required to burn PH_3 and how many grams of magnesium metaphosphate would be obtained if 204 g of Mg was was used for reducing calcium phosphide and the volumes of the gases were measured at STP?

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86. A mixutre of Cu, Fe, and Al was reacted with 13.33 g of NaOH. During chlorination with the same amount of meta mixture entered into reaction with 12.5 L of chlorine measured at STP, while for treating the same amound of the metal mixture at STP, while for treating the same amound of the metal mix mixutre

343.64 " mL of " HCl, havig a density of $.1gmL^{-1}$ and containing $10\,\%$ by mass of HCl were required. Determine the mass percentage of the metals in the mixture.

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87. Perdisulphuric acid $(H_2S_2O_8)$ or Marshall's acid can be prepared by the electrolytic oxidation of H_2SO_4. AT anode O_2 and H_2 are obtained as side products. After passing a current of 0.5 A for a certain time, the volume of H_2 and O_2 collected was found to be 10.08 and 2.24 L, respectively, at STP. What is the weight of $H_2S_2O_8$ produced during the same time? Also find the duration of electrolysis (in seconds) assuming $75\,\%$ efficiency of electronysis. Give all the electronde reaction.

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88. 1.6 g of pyrolusite ore was treted with 50 " mL of " 1.0 N oxalic acid and some sulphuric acid. The oxalic acid left undecomposed was raised to 250 mL in a flask. 25 " mL of " this solution, when titrated with 0.1 N $KMnO_4$ required 32 " mL of " this solution. Find out the percentage of pure MnO_2 and also the percentage of available oxygen from MnO_2.

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89. 1.0 g $NaHSO_3$ and Na_2SO_3 was dissolved in water to prepare a 200 mL solution. Two separate experiments were carried out.

(a). 25 " mL of " sample was mixed with 25 " mL of " I_2 solution and excess of I_2 left after the reaction with $NaHSO_3$ and Na_2SO_3 was back titrated with 0.1002 N $Na_2S_2O_3$, 1.34 " mL of " which was required (25 " mL of " I_2 solution is equivalent to 24.20" mL of " $Na_2S_2O_3$ solution).

(b). 50 " mL of " sample was oxidised to Na_2SO_4 by the action of H_2O_2,

H_2SO_4 sormed (from $NaHSO_3$) was titrated with 22.3 " mL of " 0.1 N NaOH. Find percentage of $NaHSO_3$ and Na_2SO_3 in the original sample.

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90. There are three acid-base indicators. Methyl orange (end point at $pH = 4$), bromothymol blue (end point at $pH - 7$), phenolphthalein (end point at $pH = 9$). Which is the most suitable indicator for the following titrations?

(a). H_2SO_4 with KOH

(b). KCn with HCl

(c). NH_3 with HNO_3

(d). HF with NaOH

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91. 20 " mL of " x M HCl neutralises completely 10 " mL of " 0.1 M $NaHCO_3$ solution and a further 5 " mL of " 0.2 M Na_2CO_3 to methyl orange end point. What is the value of x?

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92. How many " mL of " 0.1 N HCl is required to react completely using phenolphthalein with 2.0 g mixture of Na_2CO_3 and $NaOH$ containing equimolar amounts of two?

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93. One gram of a mixture of $NaHC_2O_4$ and $Na_2C_2O_4$ dissolved in water consumes in titration 50.28 " mL of " 0.1 N NaOH with phenolphthalein as indicator. If 1 g of the mixture is heated to constant weight, what would be the weight of Na_2CO_3 produced?

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94. A mixutre solution of KOH and Na_2CO_3 requires 15 " mL of " $\frac{N}{20}$ HCl when titrated with phenolphthalein as indicator.But the same amoound

of the solutions when titrated with methyl orange as indicator requires 25 " mL of " the same acid. Calculate the amount of KOH and Na_2CO_3 present in the solution.

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95. 500 " mL of " a solution contains 2.65 g of Na_2CO_3 and 4 g of $NaOH$. 20 " mL of " this solution titrated each time against $\frac{N}{10}H_2SO_4$. Find out the titre value if (a). Methyl orange is taken as an indicator

(b). Phenolphthalein is taken as indicator.

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96. A solution contains Na_2CO_3 and $NaHCO_3$. $10mL$ of the solution required $2.5mL of 0.1MH_2SO_4$ for neutralisation using phenolphthalein as indicator. Methyl orange is then added when a further $2.5mL of 0.2MH_2SO_4$ was required. The amount of Na_2CO_3 and $NaHCO_3$ in $1litre$ of the solution is:

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97. A sample of fuming H_2SO_4 contains H_2SO_4, SO_3 and $SO_{2.2}.0g$ of the above sample was dissolved in water to make a 500 mL solution. 50 " mL of " the above solution on titration in presence of methyl orange requires 42.4 " mL of " 0.1 N NaOH. On the other hand , 100 " mL of " the same sample solution requires 1.85 " mL of " 0.1 N of I_2 where I_2 is reduced to $I^{\ominus}$ ions. Determine the percentage composition of oleum sample. (In methyl orange,

$SO_2 + H_2O \rightarrow H_2SO_3 \xrightarrow{NaOH} HSO_3^{\ominus}$)

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98. 6.5 g mixture of sample containing KOH, NaOH, and Na_2CO_3 was dissolved in H_2O and the volume was made up to 250 mL. 25 " mL of " this solution requires 26.23 " mL of " 0.5 N H_2SO_4 using methyl orange as indicator, and 19.5 " mL of " same H_2SO_4 using phenolphathalein as

indicator for complete neutralisation. Calculate the percentage of KOH, NaOH, and Na_2CO_3 in the sample.

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99. A sample of hard water contains 1 mg $CaCl_2$ and 1 mg $MgCl_2$ per litre. Calculate the hardness of water in terms of $CaCO_3$ present in per 10^6 parts of water.

(a). 2.5 ppm

(b). 1.95 ppm

(c). 2.15 ppm

(d). 195 ppm

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100. A water sample is found to contain 96 ppm of SO_4^{2-} and 122 ppm of $HCO + 3^{\ominus}$ with $Ca^{2\square}$ ion as the only cation.

(a). Calculate the ppm of Ca^{2+} in water.

(b). Calculate the " mol of "CaO required to remove $HCO_3^{\ominus}$ ion from 1000

kg of the water.

(c). Calculate the concentration of Ca^{2+} in ppm remaining in water after adding CaO.

(d). If the Ca^{2+} ion in 1 L of The treated water are completely exhange with $H^{\oplus}$ ions, what will be its pH.

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101. Hardness of water is 200 ppm. The normality and molarity of $CaCO_3$ in the water is

(a). $2 \times 10^{-6}(N, 2 \times 10^{-6}M$

(b). $4 \times 10^{-2}N, 2 \times 10^{-2}M$

(c). $4 \times 10^{-3}N, 2 \times 10^{-3}M$

(d). $4 \times 10^{-1}N, 2 \times 10^{-1}M$

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102. A sample of hard water contains $122ppm$ of $HCO_3^{\ominus}$ ions,. What is the minimum weight of CaO required to remove ions completely from $1kg$ of

such water sample?

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103. Calculate the amount of lime and soda required for the softening of 10^6 L of a sample of boiler feed water with the following data:

$CaCO_3 = 1.4^\circ$ Clark, $MgCO_3 = 0.56^\circ$ Clark, $CaSO_4 = 0.42^\circ$ Clark, $MgSO_4 = 0.14^\circ$ Clark, $MgCl_2 = 0.035^\circ$ Clark, and $NaCl = 0.035^\circ$ Clark.

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104. A 200 mL sample of hard water requires 33.0 " mL of " 0.01 M H_2SO_4 for complete neutralisation.

200 " mL of " the same sample was boiled with 15.0 " mL of " 0.1 M NaOH solution, filtered and made up to 200 mL again. This sample now requires 53.6 " mL of " 0.01 M H_2SO_4. Calculate Mg hardness.

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105. The hardness of 10^5 L of a sample of H_2O was completely removed by passing through a zeolite softener. The bed on exhaustion required 500 L of NaCl solution containing $15gL^{-1}$ of $NaCl$ for regeneration. Calculate the hardness of the sample of water.

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106. 50 " mL of " water on titration with standard soap solution gave the following results: Lather factor $= 0.4$ mL, total hardness $(TH) = 8.2mL$, permanent hardness (PH) $= 2.5mL$ and standard hard water (containing $0.2gCaCO_3L^{-1}$) $= 19.9mL$. Calculate each type of hardness in ppm.

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107. 0.093 g of $Na_2H_2\ EDTA.2H_2O$ is dissolved in in 250 " mL of " aqueous solution. A sample of hard water containing Ca^{2+} and Mg^{2+}

ions is titrated with the above EDTA solution using a buffer of $NH_4OH + NH_4Cl$ using erochrome black-T as indicator. 10 " mL of " hard water at equivalence point. Another sample of hard water is titrated with 10 " mL of " above EDTA solution using KOH solution $(pH = 12)$. Using murexide indicator, it requires 40 " mL of " hard water at equivalence point.

(a). Calculate the amount of Ca^{2+} and Mg^{2+} present in 1 L of hard water.

(b). Calculate the hardness due to Ca^{2+}, Mg^{2+} ions and the total hardness of water in ppm of $CaCO_3$

(Given: $Mw(EDTAsalt) = 372gmol^{-1}$

$Mw(CaCO_3) = 100gmol^{-1}$)

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108. A $50mL$ sample of hard water containing Ca^{2+} and Mg^{2+} ions is titrated with $50mL.\ 0.005MEDTA$ solution at $pH = 10$, using eriochrome balck$-T$ indicator to reach equivalence point.

In a equal amount of hard water sample, Mg^{2+} ions are precipitated as

$Mg(OH)_2$ by adding suitable amount of $NaOH$. the solution, after precipitation of $Mg(OH)_2$, is stirred and then titrated with $EDTA$ solution using calcon as indicator, and it requires $10mL$ of above $EDTA$ solution to reach equivalence point.

a. Calculate the strength of Ca^{2+} and Mg^{2+} ions present in hard water.

b. Calculate the hardness due to Ca^{2+} ions in p p m of $CaCO_3$.

c. Calculate the hardness due to Mg^{2+} ions in p p m of $CaCO_3$.

d. Calculate the total hardness of water in p p m of $CaCO_3$.

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109. 100 mL sample of hard water is titrated with 500 " mL of " 0.001 M EDTA solution at $pH = 10$, using eriochrome black-T indicator to reach equivalence point. An equal another amount of hard water sample is boiled for 30 min. After filtration and cooling, the same sample is titrated with 200 " mL of " 0.011 M EDTA solution at $pH = 10$ using Mg-EDTA complex solution and erichrome black-T indicator to reach equivalence point.

(i). Calculate the total hardness of water sample (temporary +

permanent) in ppm of $CaCO_3$.

(ii). Calculate the permanent hardness of water sample in ppm of $CaCO_3$.

(iii). Calculate the temporary hardness of water sample in ppm of $CaCO_3$

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110. A 20 mL mixture of CO, CH_4, and Helium (He) gases is exploded by an electric discharge at room temperature with excess of oxygen. The volume contraction is found to be 13 mL. A further contraction of 14 mL occurs when the residual gas is treated wityh KOH solution. Find out the composition of the gaseous mixture in terms of volume percentage.

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111. 95 " mL of " a mixture of a gaseous organic compound A and just sufficient amount of oxygen required for the complete combustion yields on burning 40 " mL of " CO_2 and 70 " mL of " water vapour along with 10 " mL of " nitrogen, all volumes measured at the same temperature and pressure. Compound A contains corbon, hydrogen, and nitrogen only as

the constituent elements. Calculate.

(a). The volume of O_2 required for complete combustion

(b). The molecular formula of A.

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112. An organic compound contains carbon, hydrogen and oxygen. If the ratio percentage of C and H is $6:1$ calculate the simplest formula of the compound, given that one molecule of the compound contains half as much oxygen as would be required to burn all the carbon and hydrogen atoms in it to CO_2 and H_2O

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113. Fifty millilitre of a mixture of NH_3 and H_2 was completely decomposed into N_2 and H_2 by sparking. Forty millilitre of O_2 was then added and the mixture was sparked again. After cooling, the mixture was shaken with alkaline pyrogallol and a contraction of 6 ml was observed. Calculate the percentage of NH_3 in the original mixture.

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114. 10 " mL of " a gaseous hydrocarbon is exploded with 100 " mL of " oxygen. The residual gas on cooling is found to measure 95 mL, of which 20 mL is absorbed by caustic soda and the remaining by alkaline pyrogallol. The formula of the hydrocarbon is

(a). CH_4.

(b). C_2H_6

(c). C_2H_4

(d). C_2H_2

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115. A mixture of formic acid and oxalic acid is heated with conc H_2SO_4. The gas produced is collected and treated with KOH solution, where the volume decreases by $\frac{1}{6}$ The molar ratio of the two acids (formic acid/oxalic acid) in the original is

(a). $4:1$

(b). $1:4$

(c). $2:1$

(d). $1:2$

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116. 9 " mL of " a mixture of methane and ethylene was exploded with 30 mL (excess) of oxygen. After cooling, the volume was 21.0 mL. Further treatment with caustic potash solution reduced the volume to 7.0 mL. Determine the composition of the mixture.

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117. Ten millilitre ofa mixture of methane, ethylene, and carbon dioxide was exploded with excess of air: After the explosion, there was contraction of 17 ml and after treatment with KOH, there was a further contraction of 14 ml. What was the composition of the mixture?

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118. An organic compound $\left(C_xH_{2y}O_y\right)$ was burnt with twice the amount of oxygen needed for complete combustion to CO_2 and H_2O. The hot gases, when cooled to $0^\circ C$ and $1atm$ pressure, measured $2.24L$. The water collected during cooling weighed $0.9g$. The vapour pressure of pure water at $20^\circ C$ is $17.5mmHg$ and is lowered by $0.104mm$ when $50g$ of the organic compound is dissolved in $1000g$ of water. Give the molecular formula of the organic compound.

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119. 50 " mL of " a gaseous hydrocarbon A requried for complete combustion. 357 " mL of " air $(21\,\%$ oxygen by volume) and gaseous products occupied 327 mL (all volumes being measured at STP. The molecular formula of the hydrocarbon A is

(a). C_2H_6

(b). C_2H_4

(c). C_3H_6

(d). C_3H_6

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120. 20 " mL of " a gasous bydrocarbon (A) was exploded with excess of O_2 in an eudiometer tube. On cooling, the volume was reduced by 50 mL. On further treatment with KOH, there was further contraction of 40 mL. The molecular formula of the hydrocarbon A is

(a). C_2H_6

(b). C_2H_4

C_3H_6

(d). C_3H_8

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121. 5 " mL of " a gas A containing only C and H was mixed with an excess of O_2 (30 mL) and the mixture was exploded by means of electric sperk. After explosion, the remaining volume of the mixed gases was 25 mL. On adding a concentrated solution of KOH, the volume further diminished to

15 mL. The residual gas was pure oxygen, The molecular formula of the gas A is.

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122. A gaseous alkane was exploded with oxygen. The volume of O_2 for complete combustion to CO_2 formed was in the ratio of $7:4$. The molecular formula of alkane is:

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123. A mixture of CO and CO_2 having a volume of 30 mL is mixed with x " mL of " O_2 and electrically sparked. The volume after explosion is $(20+x)$ mL under the same condition. What would be the residual volume if 45 " mL of " the original mixture is treated with aueous NaOH?

(a). 10 mL

(b). 20 mL

(c). 30 mL

(d). mL

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124. 50 " mL of " pure and dry O_2 was subjected to silent electric discharge and on cooling to the original temperature, the volume of ozonised oxygen was found to be 47 mL The gas was brought into contact with turpentine oil, after absorption of O_3, the remaining gas occupied 41 mL volume. What is the molecular formula of ozone?

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125. 16 " mL of " a gaseous compound $C_nH_{3n}O_m$ was mixed with 60 " mL of " O_2 and sparked. The gas mixture on cooling occupied 44 mL. After treatment with NaOH solution, the volume of gas remaining was 12 mL. Deduce the formula of the compound.

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126. In basic solution CrO_4^{2-} oxidises $S_2O_3^{2-}$ to form $\left[Cr(OH)_4\right]^{\ominus}$ and SO_4^{2-} How many millilitres of 0.154 MNa_2CrO_4 are required to react with 40.0 " mL of " 0.246 M $Na_2S_2O_3$.

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127. 600 " mL of " HNO_3 and 200 " mL of " $Ca(OH)_2$ of same molarity are mixed to give a resulting solution having $pH = 1$. What is the molarity of HNO_3 and $Ca(OH)_2$?

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128. $20mL$ of a solution containing $0.2g$ of impure sample of H_2O_2 reacts with $0.316g$ of $KMnO_4$ (acidic). Calculate:

(a) Purity of H_2O_2,

(b) Volume of dry O_2 evolved at $27^\circ C$ and $750mmP$.

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129. 10 g of a mixture of $NaHC_2O_4$ and $Na_2C_2O_4$ on heating gave $6.12g$ of Na_2CO_3. Another 10 g of the mixture was dissolved in 1.0 L of solution. 25" mL of " this solution was titrated with 0.1 N NaOH. Find the volume of NaOH required.

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130. Number of ions present in 2.0litre of a solution of $0.8MK_4Fe(CN)_6$ is:

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131. What is the charge involved when 0.1 " mol of "$C_6H_5NO_2$ is reduced to C_6H_5 NHOH?

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132. 1.0 g of metal nitrate gave 0.86 g of metal carbonate. Calculate the Equivalent weight of metal.

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133. A 36 mL mixture of an alkene and propane required 171 " mL of " O_2 for complete combustion and yielded 109 " mL of " CO_2 (all volume measured at same temperature and presasure). Calculate the molecular formula of olefin and composition of the mixture by volume.

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134. 1.245 g of a sample of $CuSO_4.xH_2O$ was dissolved in water and H_2S passed till CuS was complete precipitated. The filtrate contained liberated H_2SO_4, which required 20 " mL of " $\frac{N}{2}$ NaOH for complete neutralisation. Calculate x, the number of molecules of water associated with $CuSO_4(Cu = 63.6)$

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135. A 0.5 g sample of an iron containing mineral mainly in the form of $CuFeS_2$ was reduced suitable to convert all the ferric ions into the ferrous form and was obtained as a solution. In the absence of any interfering matter, the solution required 42 " mL of " 0.1 M $K_2Cr_2O_7$ solution for titration calculate the percentage of $CuFeS_2$ in the mineral $(Cu = 63.5, Fe = 55.8)$

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136. A sample of $MnSO_{4.4}H_2O$ is reacted in air to give Mn_3O_4. The residue Mn_3O_4 is dissolved in 100 " mL of " $\frac{N}{12}FeSO_4$ containing H_2SO_4 The solution reacts completely with 50 " mL of " $KMnO_4$. 25 " mL of " this $KMnO_4$ requires 30 " mL of " $\frac{N}{10}FeSO_4$ for complete oxidation determine the amount of $MnSO_{4.4}H_2O$ in the sample.

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137. $0.804g$ sample of iron ore was dissolved in acid. Iron was oxidised to $+2$ state and it requires $47.2mL$ of $0.112NKMnO_4$ solution for titration, Calculate $\%$ of Fe and Fe_3O_4 in ore.

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138. A polyvalent metal weghing 0.1 g and having atomic weight 51 reacted will dil H_2SO_4 to give 43.9 " mL of " H_2 at STP. This solution containing the metal in the lower oxidation state was found to require 58.8 " mL of " 0.1 permanganate for complete oxidation. What are the valencies of the metal.

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139. A sample of magnisium metal containing some MgO as impurity was dissolved in 125 " mL of " 0.1 N H_2SO_4. The volume of H_2 evolved at $27.3^\circ C$ and 1 atm was 120.1 mL. The resulting solution was found to be 0.02 N with respect to H_2SO_4. Calculate (i) the weight of sample

dissolved and (ii) the percentage by weight of Mg in the sample. Neglect any change in the volume of the solution (atomic weight of $Mg = 24.3$).

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140. A sample of $Fe(SO_4)_3$ and FeC_2O_4 was dissolved in H_2SO_4. 40 " mL of " $\frac{N}{16}KMnO_4$ was required for complete oxidation. After oxidation the mixture was reduced by $\frac{An}{H_2SO_4}$. On again oxidation by same $KMnO_4$, 60 mL was required. Calculate the ratio of m" Eq of "$Fe_2(SO_4)_3$ and FeC_2O_4.

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141. What volume of 0.1 M $KMnO_4$ is required to oxidise 100 " mL of " 0.3 M FeC_2O_4 (ferrous oxalate) in acidic medium?

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142. 1.0 g a of moist sample of a mixture of KCl and $KClO_3$ was dissolved in water and made up to $250mL$. 25 " mL of " this solution was treated with SO_2. The chlorate was reduced to chloride and excess of SO_2 was removed by boiling. The total chloride was precipitated as $AgCl$. The weight of the precipitate was $0.1435g$. In another experiment, 25 " mL of " the original solution was heated with 30 " mL of " 0.2 N solution of ferrous sulphate, and the unreacted ferrous sulphate required 37.5 " mL of " 0.08 N solution of an oxidising agent for complete oxidation. Calculate the molar ratio of the chlorate to the chloride in the given mixture Fe^{2+} reacts with $ClO_3^{\ominus}$ according to the equation.

$$ClO_3^{\ominus} + 6Fe^{2+} + 6H^{\oplus} \rightarrow Cl^{\ominus} + 6Fe^{3+} + 3H_2O$$

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143. $1g$ sample of $AgNO_3$ is dissolved in $50mL$ of water, It is titrated with $50mL$ of KI solution. The AgIprecipitated is filtered off. Excess of KI filtrate is titrated with $M/10KIO_3$ in presence of $6MHCl$ till all I^- converted into ICI. It requires $50mL$ of $M/10KIO_3$ solution. $20mL$ of

the same stock solution of KI requires $30mL$ of $M/10KIO_3$ under similar conditions. Calculate $\%$ of $AgNO_3$ in sample. The reaction is

$KIO_3 + 2KI + 6HCl \rightarrow 3ICl + 3KCl + 3H_2O$

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144. 0.108 g of finely divided copper was treated with an excess of ferric sulphate solution untill Cu was completely dissolved. The solution after the addition of excess dil H_2SO_4, required $33.7mL$ of 0.1 N $KMnO_4$ for complete oxidation. Find the equation which represents the reaction between metallic copper and ferric sulphate solution. $(Cu = 63.7, Fe = 56)$

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145. A $1g$ sample of Fe_2O_3 solid of 55.2% purity is dissolved in acid and reduced by heating the solution with zinc dust. The resultant solution is cooled and made upto $100mL$. An aliquot of $25mL$ of this solution

requires $17mL$ of $0.0167M$ solution of an oxidant for titration. Calculate no.of electrons taken up by oxidant in the above titration.

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146. You are given a $2.18g$ sample containing a mixture of XO and X_2O_3. It takes 0.015 " mol of "$K_2Cr_2O_7$ to oxdise the sample completely to form $XO_4^{\ominus}$ and Cr^{3+}. If 0.0187 " mol of "$XO_4^{\ominus}$ is formed, what is the atomic mass of X?

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147. A sample of hydrazine sulphate $(N_2H_6SO_4)$ was dissolved in $100mL$ water. $10mL$ of this solution was reacted with excess of $FeCl_3$ solution and warmed to complete the reaction. Ferrous ions formed were estimated and it required $20mL$ of $M/50KMnO_4$ solutions. Estimate the amount of hudrazine sulphate in one litre of solution.

Given $4Fe^{3+} + N_2H_4 \rightarrow N_2 + 4Fe^{2+} + 4H^+$

$MnO_4^- + 5Fe^{2+} + 8H^+ \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$

Watch Video Solution

148. Borax in water gives the following:

$B_4O_7^{2-} + 7H_2O \rightarrow 4H_2BO_3 + 2\overset{\ominus}{O}H$

How many grams of borax $(Na_2B_4O_{7.10}H_2O)$ are required to

(a). Prepare 50 " mL of " 0.2 M solutionl.

(b). Neutralise 25 " mL of " 0.2 M H_2SO_4

$(Mw$ of borax $= 382)$

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149. An aqueous solution containing 0.10 g KIO_3 (formula weight $= 214.0)$ was treated with an excess of KI solution the solution was acidified with HCl. The liberated I_2 consumed 45.0 " mL of " thiosulphate solution to decolourise the blue starch-iodine complex. Calculate the molarity of the sodium thosulphate solution.

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150. A 4.0 g sample contained Fe_2O_3, Fe_3O_4, and inert material. It was treated with an excess of aq KI solution in acidic medium, which reduced all iron to Fe^{2+} ions. The resulting solution was diluted to 50 mL and a 10 mL sample of it was taken the iodine liberated in the small sample was titrated with 12.0 " mL of " 0.5 M $Na_2S_2O_3$ solution. The iodine from another 25 mL was extracted, after which the Fe^{2+} ions were titrated with 16 " mL of " 0.25 M $MnO_4^{\ominus}$ ions in H_2SO_4 solution. Calculate the mass of two oxides in the original mixture.

View Text Solution

151. A sample of Mg was burnt in air to give a mixure of MgO and Mg_3N_2. The ash was dissolved in $60Meq.$ of HCl and the resulting solution was back titrated with $NaOH$. $12Meq.$ Of $NaOH$ was then added and the solution distrilled. The ammonia released was then trapped in $10Meq.$ of second acid solution. Back titration of this solution required $6Meq.$ of the base Calculate the percentage of Mg burnt to the nitride.

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152. 6.0 g of a steel containing sulphur as an impurity was burnt in excess of oxygen, where sulphur is oxidised to SO_2. The SO_2 evolved was oxidised to SO_4^{2-} ions by the action of H_2O_2 solution in the presence of 30 mL solution of 0.04 M NaOH. 25 " mL of " 0.02 M HCl was required to neutralise the excess of NaOH after the above oxidation. Calculate the percentage of sulphur in the given sample of steel (Atomic mass of S is 32).

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153. Find the amound of iron pyrites (FeS_2) which is sufficient to produce enough SO_2 on roasting (heating in excess of O_2) such that is (SO_2) completely decolourise a 1 L solution of $KMnO_4$ containing 15.8 g L^{-1} of it. The equation are

$FeS_2 + O_2 \rightarrow Fe_2O_3 + SO_2$

$KMnO_4 + SO_2 \rightarrow MnSO_4 + H_2SO_4 + KHSO_4$

View Text Solution

154. When a mixture of NaBr and NaCl is separately digested with H_2SO_4 all the halogens are expelled and Na_2SO_4 is formed quantitatively with a particular mixture, it was found that the weight of Na_2SO_4 obtained was precisely the same as the weight of $NaBr + NaCl$ mixture taken. Calculate the ratio of the weight of NaCl and NaBr in the mixture.

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155. On being heated in air, a mixture of Feo and Fe_2O_4 picks up oxygen to convert completely to Fe_2O_3. If the observed weight gain is 5% of the initial weight, what must have been the composition of the initial mixture?

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156. In the reaction of canadium oxide (VO) with iron oxide (Fe_2O_3) the products are V_2O_5 and FeO. How many grams of V_2O_5 can be formed from 2.00 g of VO and 5.75 g of Fe_2O_3.

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157. 1.67 g mixture of Al and Zn was completely dissolved in acid and evolved 1.69 L of H_2 at STP. Calculate the weight Al and Zn in the mixture.

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158. 0.05 g of a sample of $KClO_3$ containing some KCl on decomposition liberated just sufficient oxygen for complete oxidation of 20 " mL of " CO. The volume of CO was measured at $27^\circ C$ and 750 mm Hg. Calculate the perentage purity of $KClO_3$.

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159. 2.0267 g of the nitrate of a univalent metal was heated with excess of previously ignited silica. A loss in weight of 1.08 g took place due to the total expulsion of the nitrate part of the salt as N_2O_5, calculate the percentage of $NO_3^{\ominus}$ group in the salt analysed.

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160. Brass is an ally of Cu and Zn. A sample of brass weighing 5.793 g when treated with excess of dil H_2SO_4 gives 324 " mL of " dry H_2 at $20^\circ C$ and 750 mm pressure. What is the percentage of Cu by weight in the alloy.

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161. Carnallite is a double chloride of K and Mg containing 38.86% of water. 0.458 g of it gave 0.71 g AgCl and 0.666 g of it gave 0.27 g magnesium pyrophosphate $(Mg_2P_2O_7)$. Calculate the percentage of KCl in the carnallite.

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162. Crude calcium carbide is made in an electric furance by the following reactions:

$CaO + 3C \rightarrow CaC_2 + CO$. The product contains $85\,\%$ of CaC_2 and $15\,\%$ unreacted CaO.

(a). How much CaO is to be added to the fur

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163. The vapour density of mixture consisting of NO_2 and N_2O_4 is 38.3 at $26.7^\circ C$. Calculate the number of moles of NO_2 I $100g$ of the mixture.

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164. $4.08g$ of a mixture of BaO and an unknown carbonate MCO_3 was heated strongly. The residue weighed $3.64g$. This was dissolved in $100mL$ of $1NHCl$. The excess of acid required of $16mL$ of $2.5NNaOH$ for complete neutralisation. Identify the metal M.

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165. The reaction $An + CuSO_4 \rightarrow ZnSO_4$ goes completely to the right. In an experiment, 10.0 g of Zn was added to 200 " mL of " $CuSO_4$ solution. After all the Cu was precipitated, it was found that not all the Zn had dissolved. After filtration, the total weight of the solid at the end of the reaction was 9.810 g. Calculate.

(a). The weight of copper deposited and,

(b). Molarity of $CuSO_4$ in the original solution.

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166. On passing 10.0 L of a gaseous mixture of nitrogen dioxide and N_2 at STP through a NaOH solution, a mixture of sodium nitrite and sodium nitrate in formed. A mass of 6.32 g of $KMnO_4$ is required to oxidise the above sodium nitrite in a H_2SO_4 medium. Determine the mass percentage of the gaseous mixture (N_2 does not react with NaOH.)

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167. When 1.82 g a of mixture of Al and an unkown metal. Arranged in the series of the standard reduction electrode potential below hydrogen, was dissolved in HCl, 0.672 L of H_2, measured at STP was liberated. To oxidise this mixture, 0.56 L of O_2 measured at STP was needed which unknown metal was taken? Determine the mass percentage of metals in the mixture.

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Ex 3.1

1. Balance the following equatio in basic medium

$NH_3 + O_2 \rightarrow NO_2H_2O$

In the commercial preparation of HNO_3 by Ostwald process, the above reaction is carried out directly in the process, The above reaction is carried out directly in the gaseous state. Explian why the same equation describes the direct reaction and the reaction in basic medium?

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2. $CN^{\ominus}$ is oxidised by a strong oxidising agent to $NO_3^{\ominus}$ and CO_2 or CO_3^{2-} depending upon the acidity of the reaction mixture. HNO_3 a strong oxidising agent is reduced by a moderate reducing agent to NO. Write the balanced equation of HNO_3 with KCN.

$CH^{\ominus} \rightarrow CO_2 + NO_3^{\ominus}$

$NO_3^{\ominus} NO$

If this reaction is carried out, what safety precautions are required?

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3. Complete and balance the following equation

(a). $Bi(OH)_3 + SnO_2^{2-} \rightarrow Bi + SnO_3^{2-}$

(b). $\left[Fe(CN)_6\right]^{3-} + Cr_2O_7^{2-} \rightarrow Fe^{3+} + Cr^{3+} + CO_2 + NO_3^{\ominus}$

(c). $V \rightarrow PH_3 + P_4H_2$

(d). $P_2H_4 \rightarrow PH_3 + P_4H_2$

(e). $Ca_3(PO_4)_2 + SiO_2 + C \rightarrow CaSiO_3 + P_4 + CO$

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Ex 3.2

1. Calculate the equivalent weight of the underlined species in the following unbalanced reaction:

$\underline{Br_2} + \overset{\ominus}{O} \rightarrow Br^{\ominus} + BrO_2^{\ominus}$ (basic medium)

(b). $\underline{HCuCl_2} \rightarrow Cu + Cu^{2+} + 4Cl^{\ominus} + 2H^{\oplus}$ (acidic medium)

(c). $\underline{MnO_4^{2-}} \rightarrow MnO_2 + MnO_4^{\ominus}$ (acidic medium)

(d). $KCiO_3 \xrightarrow{\Delta} KCl + O_2$

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2. (a). What is the equivalent weight of (i) $Fe(HC_2O_4)_2$,

(b). Equivalent weight of Cl_2 is 42.6 in the following disproportionation reaction:

$Cl_2 + \overset{\ominus}{O}H \rightarrow Cl^{\ominus} + H_2O + ?$ (oxidised product)

identify the oxidised product.

(c). What is the equivalent weight of $K_2S_2O_3$ in the reaction with I_2 in acidic medium?

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3. (a). What is the equivalent weight of H_3PO_2 when it disproportionates into PH_3 and H_2PO_3?

(b). What ist he equivalent weight of H_3PO_2 when it acts as an acid?

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Ex 3.3

1. Calculate the number of moles of $Cr_2O_7^{2-}$ required to oxidise 1 " mol of "$Fe(HC_2O_4)$ in acidic medium. How many moles of NaOH are required to react with 1 " mol of "$Fe(HC_2O_4)$?

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2. How many moles of $NO_2^{\ominus}$ are oxidised to $NO_3^{\ominus}$ by 2 " mol of "$MnO_4^{\ominus}$ in dilute basic medium?

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3. What is the ratio of moles of $MnO_4^{\ominus}$ used per " mol of "$C_2O_4^{2-}$ in acidic medium to strong basic medium?

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4. What is the ratio of FeC_2O_4 (ferrous oxalate) and ferric oxalate used per " mol of "$Cr_2O_7^{2-}$ in acidic medium?

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5. Complete the following reactions:

(a). $MnO_4^{2-} + H^{\oplus} \rightarrow Mn^{2+} + ?$

(b). $NO_2 + H_2O \rightarrow ? + NO$

(d). $H_2O_2 + Sn^{2+} \rightarrow Sn^{4+} + ?$

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6. Gastric juice contains 3.65 g of HCl per litre. If a person produces 2.0 L of gastric per day how many antacid tablets, each containing 520 " mg of " $Al(OH)_3$, are needed to netralise all the HCl produced in one day?

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7. 100 " mL of " each thhree samples of H_2O_2 labelled 2.8 vol 5.6vol, and 22.4 vol are mixed and then diluted with an equal volume of water. Calculate the volume strength of the resultant H_2O_2 solution.

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8. 10 " mL of " 2 M HCl and 20 " mL of " 1 M HNO_3 and V volume of $5MH_2SO_4$ are mixed together and the solution was made upto 5 L. 10 " mL of " this acid solution exactly neutralises 28.6 " mL of " Na_2CO_3 solution containing 1 g of $Na_2CO_{4.10}H_2O$ in 100 " mL of " water. Calculate the amount of SO_4^{2-} ions in grams present in solution.

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9. If 10.0 g V_2O_5 is dissolbed in acid and reduced to V^{2+} by treatment with tin (Sn) metal how many moles of I_2 could be reduced by the resulting V^{2+} solution as it is oxidised to V^{4+}? (Atomic weight of V is 51)

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10. Alcohol level in blood is determined by the reaction with $K_2Cr_2O_7$ solution in acidic medium. Calculate the blood level in mass percent if 10 "

mL of " 0.05 M solution of $K_2Cr_2O_7$ is required for the reaction of a 10.0 g sample of blood.

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11. Calculate the weight of N_2H_4 (hydrazine) oxidised to N_2 by $19.4gK_2CrO_4$, which is reduced to $Cr(OH)_4^{\ominus}$ in basic medium.

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12. 8.1 g of $K_2Cr_2O_7$ reacts with 12.8 g of HI according to the equation

$Cr_2O_{\cdot}(2-) + HI \rightarrow CrI_3 + KI + I_2$

Calculate:

(a). Percentage by mass of $K_2Cr_2O_7$ left unreasted.

(b). Volume of I_2 (g) evolved, if I_2 obtained is heated to 500 K and 1.0 atm pressure.

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13. 10.0 g of $CaOCl_2$ is dissolved in water to make 200 mL solution 20 " mL of " it is acidified with acetic acid and treated with KI solution the I_2 liberated required 40 " mL of " $\frac{M}{20}Na_2S_2O_3$ solution. Find the percentage of available chlorine.

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Ex 3.4 (A)

1. 0.5 g of a mixture of K_2CO_3 and Li_2CO_3 requires 15 " mL of " 0.25 N Hci for neutralisaion. Calculate the percentage composition of the mixture.

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2. Find the molality of 1.0 L solution of 90% H_2SO_4 by weight/volume. The density of the solution is 1.47 gcc^{-1}

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3. What volume of 0.25 MH_2SO_4 is required to neutralise 1.90 g of a mixture containing equimolar amounts of $NaHCO_3$ and $NaCO_3$?

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4. 12.25 g of $KClO_3$ and 5.85 g of $NaCl$ ar heated together. The residue obtained at the end of burning is dissolved in water to prepare a 500 mL solution. To the solution obtained, excess of $AgNO_3$ is added. Find the moles of white precipitate formed. Also find the molarity of the solution after filtering out the precipitate with respect to $NaNO_3$ and KNO_3 (molecular mass of $KClO_3$ is 122.5 and that of $NaCl$ is 58.50)

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5. In the analysis of 0.1 of sample of feldspar, 0.118 g of mixture of NaCl and KCl is obtained which on treatment with $AgNO_3$ gives 0.2451 of AgCl. Calculate the precentage of Na_2O and K_2O in feldspar.

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6. A mixture in which the mole ratio of H_2 and O_2 is $2:1$ is used to prepare water by the reaction.

$2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(g)}$

The total pressure in the container is $0.8atm$ at $20^\circ C$ before the reaction. Determine the final pressure at $120^\circ C$ after reaction assuming $80\,\%$ yield of water.

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7. Calculate the percentage concentration of the remaining solution when 500 g of a $20\,\%$ solution by weight is cooled, 40 g of solute is precipitated.

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Ex 3.4 (B)

1. A solution of $KMnO_4$ containing $3gL^{-1}$ is used to titrate H_2O_2 solution containing $2gL^{-1}$ What volume of $KMnO_4$ will be required to react with 10 " mL of " H_2O_2? Also find strength of H_2O_2 solution in terms of available oxygen.

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2. Two acids A and B are titrated separately each time with 25 " mL of " $N - Na_2CO_3$ solution to requrie 10 mL and 40 mL respectively, of their solution for complete neutralisation. What volume of A and B would you mix to produce 1 L of N-acid solution?

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3. 1.00 g of a mixture, consisting of equal number of moles of carbonates of two alkali metals, required 44.4 " mL of " 0.5 N-HCl for complete reaction. If the atomic weight of one of the metal is 7.00. Find the atomic weight of the other metal. What will be the total amount of sulphate

formed on quantitative conversion of 1.00 g of the mixture into sulphates?

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4. A sample of chalk ($CaCO_3$) is contaminated with calcium sulphate 1.0 g of the solid is dissolved in 230 " mL of " $\frac{N}{10}$ HCl, 40.1 $\frac{N}{10}$ NaOH is requried to neutralise the excess acid. What ist he percentage of chalk in the mixture.

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5. The amount of CO in a gas ample can be determined by using the reaction.

$I_2O_5 + 5CO \rightarrow I_2 + 5CO_2$

If a gas sample liberated 0.2 g of I_2, how many g of CO were present in the sample.

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6. 356 " mg of " an alloy of Zn and Cd is precipitated as ZnS and CdS by H_2S. The mixed precipitate sulphur. The filterate is acidified and the divalent Fe^{2+} reqruied 1.6 millimoles of $KMnO_4$ Find the percentage of Cd in the alloy. $(Cd = 112, Zn = 65.4)$

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7. A sample containing 0.4775 of $(NH_4)_2C_2O_4$ and inert material was dissolved in water and made strongly alkaline with KOH which converted $NH_4^{\oplus}$ to NH_3 The liberated NH_3 was distilled of H_2SO_4 was back titrated with 11.3 " mL of " 0.1214 M NaOH. Calculate (a) $\%\, of (NH_4)_2C_2O_4 = 124.10$

And atomic weight of $N = 14.0078$.

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8. A 0.5 g sample containing MnO_2 is treated with HCl liberating Cl_2 is passed into a solution of KI and 30.0 " mL of " 0.1 M $Na_2S_2O_3$ are required to titrate the liberated iodine. Calculate the percentage of MnO_2 is the sample.

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9. 0.3 g of KI is dissolved in 25 " mL of " water. After adding to this solution double its volume of concentration HCl, a solution of KIO_3 is graduaaly added with stirring. Iodine is liberated as first but redissolved. It is observed that 24.1 " mL of " iodate solution is just sufficient to dissolve the iodine. If the iodate solution contains 0.8 g per 100 mL formulate the reaction that has taken place.

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10. 0.5 g of pure iron wire was dissolved in excess of HCl in absence of air and was then heated with 0.25 g of KNO_3. The following reaction takes

place,

$3FeCl_2 + KNO_2 + 4\text{HCl} \rightarrow 3FeCl_3 + KCl + 2H_2O + NO$

When the reaction was over, the resulting solution was titrated against 0.1 N $K_2Cr_2O_7$. What volume of dichromate would be consumed? ATomic weight of $Fe = 55.585$ atomic weight of $K = 39$?

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11. The volatile chloride of an element has a vapour density ≈ 69. One gram of the chloride on hydrolysis yields hydrochloric acid and compound free of chlorine. Addition hydrochloric acid and compound free of chlorine. Addition of $AgNO_3$ to this solution precipitates 3.129 g of AgCl. What may be the atomic weight of the element.?

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12. 2 g of FeC_2O_4 are made to react in acid solution with $0.25MKMnO_4$ solution. What volume of $KMnO_4$ would be required? The be reqruied? The resulting solution is treated with excess of NH_4Cl solution and

NH_4OH solution. The precipitated $Fe(OH)_3$ is filtered off, washed and ignited. What is the mass of the product obtained? (Atomic weight of $Fe = 56$)

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13. When KIO_3 solution is heated with excess of oxalic acid it is found that 1.683 g of KIO_3 is consumed per gram of iodine liberated. Formulate the stoichemistry of the products. (Atmic weight of iodine $= 127$ and $K = -39$)

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14. 1.53 g of a compound containing only sulphur, oxygen and chlorine after easy hydrolysis with water yielded acid products which consumed 91 " mL of " $\frac{N}{2}$ sodium hydroxide for complete neutralisation in a parallel experiment, 0.4 g of the compound after hydrolysis with water, was

treated with excess of $BaCl_2$ solution and 0.7 g of $BaSO_4$ was precipitated. What is the formula of the compound?

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15. 25 " mL of " a mixture of Co, CO_2 and H_2 were exploded mL with 10 " mL of " oxygen. The products has a volume of 18.5 " mL of " which 17 mL absorbed by alkali. What was the composition of the original mixture? All volume measurements were made at the same temperature and pressure?

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16. Determine the probable formula of an acid salt which is an oxidising agent from the following data.Its equivalent weight as an acid is 390 and as an oxidising agent is 32.5. It contains 10% of potassium and 65% of iodine.

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17. Hydrogen peroxide solution $(20mL)$ reacts quantitatively with a solution of $KMnO_4(20mL)$ acidified with dilute of H_2SO_4. The same volume of the $KMnO_4$ solution is just decolourised by $10mL$ of $MnSO_4$ in neutral medium simultaneously forming a dark brown precipitate of hydrated MnO_2. The brown precipitate is dissolved in $10mL$ of $0.2M$ sodium oxalate under boiling condition in the presence of dilute H_2SO_4. Write the balanced equations involved in the reactions and calculate the molarity of H_2O_2.

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18. An aqueous solution containing 0.10 g KIO_3 (formula weight $= 214.0$) was treated with an excess of KI solution the solution was acidified with HCl. The liberated I_2 consumed 45.0 " mL of " thiosulphate solution to decolourise the blue starch-iodine complex. Calculate the molarity of the sodium thosulphate solution.

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Ex 3.5

1. 200 " mL of " a solution of a mixture of NaOH and Na_2CO_3 was first titrated with 0.1 M HCl using phenolphthalein indicator. 17.5 " mL of " HCl was required for the same HCl was again required for next end point. Find the amount of NaOH and Na_2CO_3 in the mixture.

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2. 30 " mL of " a solution of mixture of Na_2CO_3 and $NaHCO_3$ required 12 " mL of " 0.05 M H_2SO_4 using phenolphthalein as indicator. With methyl orange 30 " mL of " the same solution required 40 " mL of " same H_2SO_4. Calculate the amount of Na_2CO_3 and $NaHCO_3$ per litre in the mnixture.

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3. 0.58 g of $CH_3(CH_2)_cCOOH$ was burnt in excess air and the resulting gases (CO_2 and H_2O) were passed through excess NaOH solution. The resulting solution was divided into two equal parts. One part requires 50 " mL of " 1.0 M HCl for complete neutralisation using phenolphthalein indicator. Another part required 80 " mL of " same HCl for neutralisation using methyl orange as indicator. Calculate the value of n and the amount of excess NaOH solution taken initially.

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4. Two drops of phenolphthalein was added to 40 " mL of " HCl solution. When 30 " mL of " 0.1 M NaOH was added, part of the the solution turned pink, but colour disappeared on mixing the solutiion. Addition of NaOH was continued drop-wise untill a one-drop addition produced a lasting pink colour, and the colume of NaOH added was 32.56 mL. Calculate

(a). The concentration of HCl solution.

(b). The concentration of HCl solution when 30 mL base was added.

(c). The pH of solution when 30 mL base was added.

(d). The pH of solution when 32.56 mL base was added

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5. 50 " mL of " a solution containing 1 g each of Na_2CO_3, $NaHCO_3$ and $NaOH$ was titrated with N HCl. What will be the titre value if:

(a). Only phenolphthalein is used as an indicator? ltbr. (b). Only methyl orange is used as an indicator from the very begining?

(c). Methyl orange is added after the first end point with phenolphthalein?

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6. 1.7225 g of a metal (bivalent) salt $A_x(CO_3)_y(OH)_z$ was dissolved in water to make 100 " mL of " solution 50 " mL of " this solution required 10 " mL of " 0.5 M H_2SO_4 solution for complete neutralisation using phenolphthalein indicator. Another 50 mL solution required 15 " mL of " same acid using methyl orange indicator. Deduce the formula of the salt.

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Ex 3.6

1. If water contains 10 ppm of $MgCl_2$ and 8 ppm of $CaSO_4$, calculate the ppm of $CaCO_3$.

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2. Calculate the quantity of lime required to soften $10^3 L$ of H_2O which contains $7.5 g L^{-1}$ of $Ca(HCO_3)_2$ and $5.0 g L^{-1} of Mg(HCO_3)_2$

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3. Calculate the quantities of reagents required to soften 10^3 L of water containing $Ca(HCO_3)_2$ $Mg(HCO_3)_2$ and $CaSO_4$ as 20.0 g, 15.0 g and 5.0 g per litre respectively by lime soda process.

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4. Calculate the quantities fo reagents required to soften 100 L of water containing the following impurities per litre in it.

(a). $CaCO_3 = 20$,

(b). $MgCl_2 = 8.0g$,

(c). $MgSO_4 = 7g$,

(d). $MgCO_3 = 4.5g$

(e). $CaSO_4 = 2.5g$

(f). $NaCl = 6.0g$

Purity of lime $= 90\,\%$ purity of soda $= 99.5\,\%$

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5. 100 " mL of " tap water was titrated with $\frac{M}{50}$ HCl with methyl orange as indicator if 30 " mL of " HCl were required, calculate the hardness of $CaCO_3$ per 10^5 parts of water. The hardness is temporary.

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6. In the determination of hardness of a sample of water, the following results were obtained:

Volume of sample of $H_2O = 100mL$

Volume of $\frac{N}{50}Na_2CO_3$ added to it $= 20mL$

Volume of $\frac{N}{50}H_2SO_4$ used to back titrate the unreacted $Na_2CO_3 = 10mL$

Calculate the hardness of water in g L^{-1}

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7. An exhausted zeolite bed was revived by 250 L of NaCl solution containing $50gL^{-1}$ of NaCl solution. How many litres of hard water of hardness 250 ppm can be softened on the zeolite bed?

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8. A sample of hard water has a hardness of 510 ppm. Express the hardness in French and Clark.

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9. A 200 mL sample of water requires 5 " mL of " $\frac{N}{20}Na_2CO_3$ solution for complete precipitation of Ca^{2+} and $CaCO_3$. Calculate the hardness in ppm.

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10. 50 " mL of " water required 4 " mL of " $\frac{N}{50}HCl$ for complete neutralisation. 200 " mL of " this water was then boiled with 10 " mL of " $\frac{N}{10}$ soda reagent. After filtration, the filtrate and the washing were made up to 200 mL with distilled water 50 " mL of " this solution required 8.0 " mL of " $\frac{N}{50}$ HCl for complete neutralisation. CAlculate the temporary and permanent hardness in ppm.

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Ex 3.7

1. $60ml$ of mixture of equal volumes of Cl_2 and an oxide of chloine, i.e., Cl_2O_n was heated and then cooled back to the original temperature. The resulting gas mixture was found to have volume of $75ml$. On treatment with KOH solution, the volume contracted to $15ml$. Assume that all measurements are made at the same temperature and pressure. Deduce the value of n in Cl_2O_n. The oxide of Cl_2 n heating decomposes quantiatively to O_2 and Cl_2.

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2. A 20 mL mixture of ethane, ethylene, and CO_2 is heated with O_2. After the explosion, there was a contraction of 28 mL and after treatment with KOH, there was a further contraction of 30 mL. What is the composition of the mixture?

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3. 8.4 " mL of " gaseous hydrocarbon A was burnt with 50 " mL of " O_2 in a eudiometer tube. The volume of the products after cooling to room temperature was 37.4 mL. When reacted with NaOH, the volume contracted to 3.8 mL. What is the molecular formula of A.

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4. The weight of 1 L sample of ozonised oxygen at STP was found to be 1.5 g When 100 " mL of " this mixture at STP was treated with turpentine oil, the volume was reduced to 90 mL. Calculate the molecular weight of ozone.

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5. 14 g of O_2 and 4 g of C_3H_8 are allowed to react to the maximum possible extent to form only CO and H_2O. Find the weight of CO formed.

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Exercises Subjective

1. A sample of clay was partially dried. It then contained 50% slica and 7% water. The original clay contained 12% water find the percentage of silica in the original sample

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2. Chlloride samples are prepared for analysis by using NaCl, KCl, NH_4Cl separately or as mixtures. What minimum volume of a 5.0% by weight $AgNO_3$ Solution (Density $= 1.04$) must be added to a sample wehging 0.3 g in order to ensure complete precipitation of choride in every possible cases?

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3. 2.1 g of a mixture of $NaHCO_3$ and $KCIO_3$ required 100 " mL of " 0.1 HCl for complete reaction. Calculate the amount of residue that would be obtained on heating 2.2 g of the same mixture strongly.

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4. 50 g caustic soda is completely converted into sodium chlorate and sodium chloride by the action of chlorine What weight of manganese dioxide and what volume of HCl (containing $300gL^{-1}$) were used for the production of necessary chlorine?

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5. 1.0g sample of KCl_3 was heated under such condition that a part of it decomposed according to the equation.

$2KClO_3 \rightarrow 2KCl + 3O_2$ and the remaining underwent change according to the equation.

$4KClO_3 \rightarrow 3KClO_4 + KCl.$

If the amount of O_2 evolved was 145.8 mL at STP. Calculate the percentage by weight of $KClO_4$ in the residue.

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6. One litre of an acidified solution of $KMnO_4$ containing 15 g of $KMnO_4$ is decolourised by passing sufficient amount of SO_2. If SO_2. If SO_2 is produced by roasting of iron pyrites (FeS_2). What will be the amount of pyrites required to produce the necessary amount of SO_2

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7. A 10.0 g sample of a mixture of $CaCl_2$ and $NaCl$ is treated to precipitate all the calcium as calcium carbonate. Thus $CaCO_3$ is heated to convert all the Ca to CaO and the final mass of CaO is 1.62 g. What is the percentage by mass of $CaCl_2$ in the original mixture?

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8. 1.5 gof brass containing Cu and Zn reasts with 3.0 M HNO_3 solution. The following reaction take place:

$$Cu + HNO_3 \rightarrow Cu^{2+} + NO_2(g) + H_2O$$

$$Zn + H^{\oplus} + NO_3^{\ominus} \rightarrow NH_4^{\ominus} + Zn^{2+} + H_2O$$

(a). Calculate the percentage composition of brass.

(b). How many " mL of " 3.0 HNO_3 will be required for completely reacting with 1.0 g of brass?

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9. A mass of 2.72 g of an alloy containing Pb, required for dissolved in HNO_3 containing $50\ \%$ by mass of HNO_3. When a H_2SO_4 solution was added, 1.5 g of precipitate (A) appeared H_2S gas was then passed into the remaining solution a secfond precipitate was formed which when calcined in air produced 1.6 g of a compound B. Determine the composition of an alloy. (Al does not form Al_2S_3 due to the hydrolysis of sulphide).

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10. On passing 10.0 L of a gaseous mixture of NO_2 and N_2 at STP, through an $NaOH$ solution, a mixture of $NaNO_2$ and $NaNO_3$ is formed 6.32 g of $KMnO_4$ is required to oxidise above $NaNO_2$ in H_2SO_4 medium. Determine the percentage by mass of gaseous mixture (N_2 does not react with $NaOH$)

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11. A sample of pure CuO was reduced with H_2 gas and H_2O formed was collected in a 44.8 L flask containing dry N_2. At $27^\circ C$, the total pressure containing N_2 and H_2O was 1.0 atm. The relative humidity in the flask was $80\,\%$ The vapour pressure of water at $27^\circ C$ is 25 mm. How many grams of CuO was reduced?

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12. A mixture of iron (II) and lead (II) caerbonates was calcined. As a result of thisk, an amount of 0.9 " mol of "CO_2 was evolved. The mixture of metal oxides obtained by decomposing the above carbonates was treated with sulphuric acid, which, resulted in a mass of 151.6 g of a sulphate as precipitate. Determine the composition of the starting mixture of carbonates in mass percentage.

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13. Calculate the percentage of oxalate ion in a given sample of oxalate salt of which 0.6 g dissolved 100 " mL of " water required 90 " mL of " $\frac{M}{100}KMnO_4$ for complete oxidation.

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14. 0.56 g of limestrone was treated with oxalic acid to give CaC_2O_4. The precipitate decolourised 50 " mL of " $\frac{M}{25}$ $KMnO_4$ in acidic medium. Calculate percentage of CaO in limestone.

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15. Calculate the weight of MnO_2 and the volume of HCl of specific gravirty 1.2 g g mL^{-1} and $5\ \%$ by weight needed to produce 1.12 L of Cl_2 at STP by the reaction $MnO_2 + 4\mathrm{HCl} \rightarrow MnCl_2 + 3H_2O + Cl_2$

View Text Solution

16. In the following reaction

$\overset{\ominus}{O}H + S_2O_3^{2-} + Br_2 \rightarrow SO_4^{2-} + Br^{\ominus}$

Starting with 0.15 " mol of "Br^2 0.01 " mol of "$S_2O_3^{2-}$ and 0.4 " mol of "$\overset{\ominus}{O}H$ ions. How many moles of $\overset{\ominus}{O}H$ ions are left in the solution after the reaction is complete.

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17. Chlorine dioxide (ClO_2) is used now days for water treatment rather than Cl_2 ClO_2 is obtained by passing $(Cl_2(g))$ into a concentrated solution of sodium chlorite $(NaClO_2)$. The reaction gives $90\,\%$ yield. How many moles of ClO_2 is produced in 3.78 L of 2.0 M $NaClO_2(aq)$?

Watch Video Solution

18. In the reaction given

$Mg(s) + NO_3^{\ominus} + H_2O \rightarrow Mg(OH)_2(s) + \overset{\ominus}{O}HO(aq.) + NH_3(g)$ 20 " mL of " sample of $NO_3^{\ominus}$ solution is treated with Mg. The NH_3^g was passed into 50 " mL of " 0.1 M HCl. The excess HCl requried 30 " mL of " 0.1 M KOH for its neutralisation calculate the molarity of $NO_3^{\ominus}$ ions in the original sample?

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19. Calculate the percentage of Cr in a sample of dichromate ore if 1.0 g of the sample after fusion is treated with 60 " mL of " 0.1 N

$FeSO_4.(NH_4)_2SO_4$ and the excess of Fe^{2+} requires 11.2 mL of $K_2Cr_2O_3$ in the sample.

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20. Chile salt peter a source of $NaNO_3$ also contains $NaIO_3$ the $NaIO_3$ is a source of I_2 produced as shown in the following equation:

Step I: $IO_3^{\ominus} + 3HSO_3^{\ominus} + 3SO_4^{2-}$

Step II: $5I^{\ominus} + IO_3^{\ominus} + 6H^{\oplus} \rightarrow 3I_2(s) + 3H_2O$

One litre sample of chile salt peter solution containing 6.6 g $NaIO_3$ is treated with $NaHSO_3$ Now an additional amount of same solution is added to the reaction mixture to bring about the second titration. Calculate the weight of $NaHSO_3$ requried in step I and what additional volume of chile salt peter mist be added in step II to bring out complete conversion of $I^{\ominus}$ to I_2.

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21. $0.5g$ mixture of $K_2Cr_2O_7$ and $KMnO_4$ was treated with excess of KI in acidic medium. Iodine liberated required $100cm^3$ of $0.15N$ sodium thiosulphate solution for titration. Find the per cent amount of each in the mixture.

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22. A mixture containing As_2O_3 and As_2O_3 requried 20 " mL of " 0.05 N I_2 for titration. The resulting solution is then acidified and excess KI was added. The liberated I_2 required 1.24 g hypo $(Na_2S_2O_3.H_2O)$ for complete reaction. Calculate the mass of the mixture.

The reactions are

$$As_2O_3 + 2I_2 + 2H_2O \rightarrow As_2O_3 + 4H^{\oplus} + 4I^{\ominus}$$

$$As_2O_5 + 4H^{\oplus} + 4I^{\ominus} \rightarrow As_2O_3 + 2I_2 + 2H_2O$$

View Text Solution

23. Ozone an estimated in air by passing certaing volume of air through an acidified or neutral or basic KI solution when O_2 is evolved and $I^{\ominus}$ is oxidised to I_2. Free I_2 evolved is titrated with standard $Na_2S_2O_3$ solution. In an experiment 10 L of air at 1 atom and $27^{\circ}C$ was passed through an alkaline KI solution and I_2 liberated requried 2 " mL of " $\frac{M}{800}Na_2S_2O_3$ solution. Calculate the volume percentage of O_3 in sample.

View Text Solution

24. 1.0 g sample of the Rochelle salt

$[NaOOC-CHOH-CHOH-COOK]$

$(NaKC_4H_4O_6.4H_2O)(Mw=282)$, on ignition, is converted into $NaKCO_3(Mw=122)$, which is titrated with 50 " mL of " 0.1 MH_2SO_4. The excess of H_2SO_4 requries 30 mL 0.2 M KOH.

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25. 2.0 g sample of NaCN is dissolved in 50 " mL of " 0.3 M mild alkaline $KMnO_4$ and heated strongly to convert all the $CN^{\ominus}$ to $OCN^{\ominus}$. The solution after acidification with H_2SO_4 requries 500 " mL of " 0.05 M $FeSO_4$ Calculate the percentage purity of NaCN in the sample.

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26. $12.\ g$ of an impure sample of arsenious oxide was dissolved in water containing $7.5g$ of sodium bicarbonate and the resulting solution was diluted to $250mL$. $25mL$ of this solution was completely oxidised by $22.4mL$ of a solution of iodine. $25mL$ of this iodine solution reacted with same volume of a solution containing $24.8g$ of sodium thiosulphate $(Na_2S_2O_3.5H_2O)$ in one litre. Calculate teh percentage of arsenious oxide in the sample (Atomic mass of $As = 74$)

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27. 10.0 g sample of Cu_2O is disoolved dissolved in dil. H_2SO_4 where it undergoes disproportionation quantitatively. The solution is filtered off and 8.3 g pure KI cyrstals are added to clear filtrate in order to precipitate CuI with the liberation of I_2. The solution is again filtered and boiled till all the I_2 is removes. Now excess of an oxidising agent is added to the rfiltrate which liberates I_2 again. The liberated I_2 now percentrage by mass of Cu_2O in the sample.

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28. 3.0 g sample of KOCl and $CaOCl_2$ is dissolved in water to prepare 100 mL solution, which requried 100 " mL of " 0.15 M acidified $K_2C_2O_4$. For the point. The clear solution is now treated with excess of $AgNO_3$ solution which precipitates 2.87 g of $AgCl$. Calculate the mass percentage of KOCl and $CaOCl_2$ in the mixture.

View Text Solution

29. One mole of a mixture of N_2, NO_2 and N_2O_4, has a mean molar mass of 55.4. On heating to a temperature at which N_2O_4 may be dissociated $: N_2O_4 \rightarrow 2NO_2$, the mean molar mass tends to the lower value of 39.6. What is the mole ratio of $N_2 : NO_2 : N_2O_4$ in the original mixture?

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30. 0.75 mole of solid A_4 and 2 mole of gaseous O_2 are heated to react completely in a sealed bottle to produce gaseous compound A_3O_n. After the compound is formed, the vessel is brought to initial temperature, the pressure is found to half of initial pressure. The value of n is _____.

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31. A difinite amount of $BaCl_2$ was dissolved in HCl solution of unknown normality. 20 " mL of " this solution was treated with 21.4 " mL of " 01 N NaOH, for complete neutralisation. Further 20 " mL of " the solution was added to 50 " mL of " 0.1 N Na_2CO_3 and the precipitate was filtered off.

The filtrate reacted with 10.5 " mL of " 0.08 N H_2SO_4 using phenolphthalein as indicator. Calculate the strength of $BaCl_2$ in mixture.

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Exercises Linked Comprehension

1. $KMnO_4$ reacts with $Na_2S_2O_3$ in acidic, strongly basic and aqueous (neutral) media. $100mL$ of $LMnO_4$ reacts with 100 mL of 0.1 M $Na_2S_2O_3$ in acidic, basic and neutral media.

Q. The molarity (M) of $KMnO_4$ solution in the acidic medium is

A. 0.2 M

B. 0.02 M

C. 0.4 M

D. 0.04 M

Answer: B

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2. $KMnO_4$ reacts with $Na_2S_2O_3$ in acidic, strongly basic and aqueous (neutral) media. $100mL$ of $LMnO_4$ reacts with 100 mL of 0.1 M $Na_2S_2O_3$ in acidic, basic and neutral media.

Q. The molarity (M) of $KMnO_4$ solution in basic medium is:

A. 0.8 M

B. 0.08 M

C. 0.26 M

D. 0.026 M

Answer: A

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3. $KMnO_4$ reacts with $Na_2S_2O_3$ in acidic, strongly basic and aqueous (neutral) media. $100mL$ of $LMnO_4$ reacts with 100 mL of 0.1 M $Na_2S_2O_3$

in acidic, basic and neutral media.

Q. The molarity (M) of $KMnO_4$ in aqueous medium is

A. 0.8 M

B. 0.08 M

C. 0.26 M

D. 0.026 M

Answer: C

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4. The molarity (m) of $KMnO_4$ in the acidic medium is (densityh of $KMnO_4$ solution $= 1.58gmL^{-1}Mw(KMnO_4) = 158gmol^{-1}$)

A. 0.025

B. 0.25

C. 0.12

D. 0.012

Answer: D

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5. 20 " mL of " $\frac{M}{60}$ $KBrO_3$ was reacted with a sample of SeO_3^{2-} 20 The Br_2 thus evolved was removed and the excess of $NaAsO_2$ The reaction involved are

$SeO_3^{2-} + BrO_3^{\ominus} + H^{\oplus} \rightarrow SeO_4^{2-} + Br_2 + H_2O$ .. (i)

$BrO_3^{\ominus} + ASO_2^{\ominus} + H_2O \rightarrow Br^{\ominus} + AsO_4^{3-} + H^{\oplus}$ ..(ii)

$\left[Mw\left(SeO_3^{2-}\right) = 79 + 48 = 127 gmol^{-1}\right]$

Q. n-factors of $BrO_3^{\ominus}$ ion in equations (i) and (ii) respectively are

A. 10,6

B. 5,6

C. 6,10

D. 6,5

Answer: B

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6. 20 " mL of " $\frac{M}{60}$ $KBrO_3$ was reacted with a sample of SeO_3^{2-} 20 The Br_2 thus evolved was removed and the excess of $NaAsO_2$ The reaction involved are

$SeO_3^{2-} + BrO_3^{\ominus} + H^{\oplus} \rightarrow SeO_4^{2-} + Br_2 + H_2O$ .. (i)

$BrO_3^{\ominus} + ASO_2^{\ominus} + H_2O \rightarrow Br^{\ominus} + AsO_4^{3-} + H^{\oplus}$ ..(ii)

$\left[Mw\left(SeO_3^{2-}\right) = 79 + 48 = 127 gmol^{-1}\right]$

Q. Excess of m" Eq of "$BrO_3^{\ominus}$ in reaction (ii) is

A. $\frac{1}{6}$

B. $\frac{11}{6}$

C. $\frac{1}{36}$

D. $\frac{11}{36}$

Answer: A

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7. 20 " mL of " $\frac{M}{60}$ $KBrO_3$ was reacted with a sample of SeO_3^{2-} 20 The Br_2 thus evolved was removed and the excess of $NaAsO_2$ The reaction involved are

$SeO_3^{2-} + BrO_3^{\ominus} + H^{\oplus} \rightarrow SeO_4^{2-} + Br_2 + H_2O$ .. (i)

$BrO_3^{\ominus} + ASO_2^{\ominus} + H_2O \rightarrow Br^{\ominus} + AsO_4^{3-} + H^{\oplus}$ ..(ii)

$\left[Mw\left(SeO_3^{2-}\right) = 79 + 48 = 127 gmol^{-1}\right]$

Q. m" Eq of "SeO_3^{2-} is

A. $\frac{55}{72}$

B. $\frac{55}{36}$

C. $\frac{11}{36}$

D. $\frac{11}{6}$

Answer: B

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8. 20 " mL of " $\frac{M}{60}$ $KBrO_3$ was reacted with a sample of SeO_3^{2-} 20 The Br_2 thus evolved was removed and the excess of $NaAsO_2$ The reaction involved are

$SeO_3^{2-} + BrO_3^{\ominus} + H^{\oplus} \rightarrow SeO_4^{2-} + Br_2 + H_2O$ .. (i)

$BrO_3^{\ominus} + ASO_2^{\ominus} + H_2O \rightarrow Br^{\ominus} + AsO_4^{3-} + H^{\oplus}$ ..(ii)

$\left[Mw\left(SeO_3^{2-}\right) = 79 + 48 = 127gmol^{-1}\right]$

Q. Amount of SeO_3^{2-} in mg is

A. 19.4 mg

B. 194 mg

C. 970 mg

D. 97 mg

Answer: D

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9. 20 " mL of " $\frac{M}{60}$ $KBrO_3$ was reacted with a sample of SeO_3^{2-} 20 The Br_2 thus evolved was removed and the excess of $NaAsO_2$ The reaction involved are

$SeO_3^{2-} + BrO_3^{\ominus} + H^{\oplus} \rightarrow SeO_4^{2-} + Br_2 + H_2O$ .. (i)

$BrO_3^{\ominus} + ASO_2^{\ominus} + H_2O \rightarrow Br^{\ominus} + AsO_4^{3-} + H^{\oplus}$ ..(ii)

$\left[Mw\left(SeO_3^{2-}\right) = 79 + 48 = 127 gmol^{-1}\right]$

Q. Which of the following is true (T) or false (F)?

A. Excess of m" Eq of "$BrO_3^{\ominus} = m$ Eq of $AsO_2^{\ominus}$ in reaction (ii)

B. m Eq of SeO_3^{2-} = otal m" Eq of "$BrO_3^{\ominus}$

C. m mol of SeO_3^{2-} = total m " mol of "$BrO_3^{\ominus}$ = m" mol of " $BrO_3^{\ominus}$ (excess) in reaction (ii).

D. m" Eq of "SeO_3^{2-} = total m" Eq of "$BrO_3^{\ominus} - m$ Eq of $Bro_3^{\ominus}$ (excess) usd in reaction (ii)

Answer: A

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10. A mixture of CO and CO_2 when treated with I_2O_5 gives I_2 vapours accoeding to the following equation:

$5CO + I_2O_5 \rightarrow 5CO_2 + I_2$

I_2 vapour was separated and treated with $HClO_4$ and the resultant HIO_4 required 0.001 " mol of "hlycerol for complete oxidation. After treatment with I_2O_5 and removal of I_2 ,t he mixture was treated with excess of 0.1 N NaOH solution and finally this solution required 20 " mL of " 1 N HCl to reach end point using phenolphthalein as indicator, followed by methyl orange as indicator after the first end point, 10 " mL of " further HCl was consumed.

Q. The number of moles of CO present initially is

A. 0.001

B. 0.002

C. 0.005

D. 0.01

Answer: C

Watch Video Solution

11. A mixture of CO and CO_2 when treated with I_2O_5 gives I_2 vapours accoeding to the following equation:

$5CO + I_2O_5 \rightarrow 5CO_2 + I_2$

I_2 vapour was separated and treated with $HClO_4$ and the resultant HIO_4 required 0.001 " mol of "hlycerol for complete oxidation. After treatment with I_2O_5 and removal of I_2 ,t he mixture was treated with excess of 0.1 N NaOH solution and finally this solution required 20 " mL of " 1 N HCl to reach end point using phenolphthalein as indicator, followed by methyl orange as indicator after the first end point, 10 " mL of " further HCl was consumed.

Q. The total volume of NaOH used in the problem is

A. 30 Ml

B. 300 mL

C. 60 mL

D. 600 mL

Answer: B

Watch Video Solution

12. A mixture of CO and CO_2 when treated with I_2O_5 gives I_2 vapours accoeding to the following equation:

$5CO + I_2O_5 \rightarrow 5CO_2 + I_2$

I_2 vapour was separated and treated with $HClO_4$ and the resultant HIO_4 required 0.001 " mol of "hlycerol for complete oxidation. After treatment with I_2O_5 and removal of I_2 ,t he mixture was treated with excess of 0.1 N NaOH solution and finally this solution required 20 " mL of " 1 N HCl to reach end point using phenolphthalein as indicator, followed by methyl orange as indicator after the first end point, 10 " mL of " further HCl was consumed.

Q. Total number of millimoles of CO_2 in the above problem is

A. 5

B. 10

C. 50

D. 100

Answer: B

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13. if 20 mL $\frac{M}{10}Ba(MnO_4)_2$ compeletely reacts with FeC_2O_4 in acidic medium,

Q. m" Eq of "FeC_2O_4 reacted is

A. 6

B. 20

C. 40

D. none

Answer: B

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14. if 20 mL $\frac{M}{10}Ba(MnO_4)_2$ compeletely reacts with FeC_2O_4 in acidic medium,

Q. Millimoles of FeC_2O_4 reacted is

A. $\frac{20}{3}$

B. $\frac{20}{2}$

C. $\frac{20}{6}$

D. $\frac{20}{10}$

Answer: A

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15. if 20 mL $\frac{M}{10}Ba(MnO_4)_2$ compeletely reacts with FeC_2O_4 in acidic medium,

Q. What is the volume of CO_2 produced at STP

A. 112 mL

B. 224 mL

C. 448 mL

D. none

Answer: B

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16. Direct titration of I_2 with a reducing agent is called iodimetry. If I_2 is leberated by the oxidation of $I_{\ominus}$ ion by a strong oxidising agent in neutral or acidic medium, the liberated I_2 is then titrated with reducing agent. Iodometry is used to estimate the strngth of the oxidising agent. For example, in the estimation of Cu^{2+} with $S_2O_3^{2-}$

$Cu^{2+} + I^{\ominus} \rightarrow CuI_2 + I_2$ (iodometry)

$I_2 + S_2O_3^{2-} \rightarrow S_4O_6^{2-} + I^{\ominus}$ (iodimetry)

Strach is used as an indicator at the end point, which forms bluecoloured complex with $I_3^{\ominus}$ Disappearance of blue colourindicates the end point whe free I_2 in not present.

Q. In the reaction

$2CuSO_4 + 4KI \rightarrow Cu_2I_2 + 2K_2SO_4 + I_2$

The equivalent weight of $CuSO_4$ is

$(Mw = 159.5gmol^{-1})$

A. Mw

B. $\frac{Mw}{2}$

C. $\frac{Mw}{4}$

D. $\frac{Mw}{8}$

Answer: A

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17. 638.0 g of $CuSO_4$ solution is titrated with excess of 0.2 M KI solution. The liberated I_2 required 400 " mL of " 1.0 M $Na_2S_2O_3$ for complete reaction. The percentage purity of $CuSO_4$ in the sample is

A. $5\ \%$

B. $10\ \%$

C. $15\ \%$

D. $20\ \%$

Answer: B

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18. Direct titration of I_2 with a reducing agent is called iodimetry. If I_2 is leberated by the oxidation of $I_{\ominus}$ ion by a strong oxidising agent in neutral or acidic medium, the liberated I_2 is then titrated with reducing agent. Iodometry is used to estimate the strngth of the oxidising agent. For example, in the estimation of Cu^{2+} with $S_2O_3^{2-}$

$Cu^{2+} + I^{\ominus} \rightarrow CuI_2 + I_2$ (iodometry)

$I_2 + S_2O_3^{2-} \rightarrow S_4O_6^{2-} + I^{\ominus}$ (iodimetry)

Strach is used as an indicator at the end point, which forms bluecoloured complex with $I_3^{\ominus}$ Disappearance of blue colourindicates the end point

whe free I_2 in not present.

Q. The volume of KI solution used for $CuSO_4$ is:

A. 1L

B. 2L

C. 4L

D. 5L

Answer: C

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19. 12 g of impure cyanogen undergoes hydrolysis by two different paths.

(i). $(CN)_2 + 4H_2O \rightarrow (NH_4)_2C_2O_4$

(ii). $(CN)_2 + 2H_2O \rightarrow NH_2CONH_2$

When 11.52 g of pure ammonium carbonate $\left[(NH_4)_2CO_3\right]$ was heated, the exact amount of urea was obtained. 20 " mL of " 1.6 M acidic $KMnO_4$ is required to completely oxidise $(NH_4)_2C_2O_4$.

Q. The percentage purity of cyanogen

A. $86.67\ \%$

B. $76.67\ \%$

C. $66.67\ \%$

D. $56.67\ \%$

Answer: A

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20. 12 g of impure cyanogen undergoes hydrolysis by two different paths.

(i). $(CN)_2 + 4H_2O \rightarrow (NH_4)_2C_2O_4$

(ii). $(CN)_2 + 2H_2O \rightarrow NH_2CONH_2$

When 11.52 g of pure ammonium carbonate $\left[(NH_4)_2CO_3\right]$ was heated, the exact amount of urea was obtained. 20 " mL of " 1.6 M acidic $KMnO_4$ is required to completely oxidise $(NH_4)_2C_2O_4$.

Q. The percentage progress of reaction in path (i) is

A. $40\ \%$

B. $60\ \%$

C. $30\ \%$

D. 70%`

Answer: A

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21. 12 g of impure cyanogen undergoes hydrolysis by two different paths.

(i). $(CN)_2 + 4H_2O \rightarrow (NH_4)_2C_2O_4$

(ii). $(CN)_2 + 2H_2O \rightarrow NH_2CONH_2$

When 11.52 g of pure ammonium carbonate $\left[(NH_4)_2CO_3\right]$ was heated, the exact amount of urea was obtained. 20 " mL of " 1.6 M acidic $KMnO_4$ is required to completely oxidise $(NH_4)_2C_2O_4$.

Q. The percentage progress of reaction in path (ii) is

A. $40\ \%$

B. $60\ \%$

C. 30%

D. 70%`

Answer: B

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22. 12 g of impure cyanogen undergoes hydrolysis by two different paths.

(i). $(CN)_2 + 4H_2O \rightarrow (NH_4)_2C_2O_4$

(ii). $(CN)_2 + 2H_2O \rightarrow NH_2CONH_2$

When 11.52 g of pure ammonium carbonate $\left[(NH_4)_2CO_3\right]$ was heated, the exact amount of urea was obtained. 20 " mL of " 1.6 M acidic $KMnO_4$ is required to completely oxidise $(NH_4)_2C_2O_4$.

Q. In which reaction, carbon is oxidised?

A. Reaction (i)

B. Reaction (ii)

C. Both

D. none

Answer: B

Watch Video Solution

23. In the study of titration of NaOH and Na_2CO_3. NaOH and $NaHCO_3$, Na_2CO_3 and $NaHCO_3$, phenophthalein and methyl orange are used as indicators.

(a). When phenolphthalein is used as an indicator for the above mixture:

(i). It indicates complete neutralisation of NaOH or KOH

(ii). It indicates half neutralisation of Na_2CO_3 because $NaHCO_3$ is formed at the end point.

(b). When methyl orange is used as an indicator for the above mixture

(i). It indicates complete neutralisation of $NaOH$ or KOH

(ii). It indicates half neutralisation of Na_2CO_3 because $NaCl$ is formed at the end point.

Q. A 10 g moxture of $NaHCO_3$ and KOH is dissolved in water to make 1000 mL solution. 100 " mL of " this solution required 50 " mL of " 0.2 M

HCl for complete neutralisation in the presence of phenolphthalein as indicator What is the percentage of $NaHCO_3$ in the mixture?

A. $50\ \%$

B. $56\ \%$

C. $44\ \%$

D. $60\ \%$

Answer: C

Watch Video Solution

24. In the study of titration of NaOH and Na_2CO_3. NaOH and $NaHCO_3$, Na_2CO_3 and $NaHCO_3$, phenophthalein and methyl orange are used as indicators.

(a). When phenolphthalein is used as an indicator for the above mixture:

(i). It indicates complete neutralisation of NaOH or KOH

(ii). It indicates half neutralisation of Na_2CO_3 because $NaHCO_3$ is formed at the end point.

(b). When methyl orange is used as an indicator for the above mixture

(i). It indicates complete neutralisation of $NaOH$ or KOH

(ii). It indicates half neutralisation of Na_2CO_3 because $NaCl$ is formed at the end point.

Q. 1 L solution of Na_2CO_3 and $NaOH$ was made in H_2O. 100 " mL of " this solution required 20 " mL of " 0.4 M HCl in the presence of phenolphthalein however, another 100 mL sample of the same solution required 25 " mL of " the same acid in the presence of methyl orange as indicator. What is the molar ratio of Na_2CO_3 and $NaOH$ in the original mixture.

A. $3:2$

B. $3:1$

C. $1:3$

D. $1:1$

Answer: C

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25. H_2O_2 is reduced rapidly by Sn^{2+}. H_2O_2 is decomposed slowly at room temperature to yield O_2 and H_2O_2. $136g$ of $10\,\%$ by mass of H_2O_2 in water is treated with $100mL$ of $3MSn^{2+}$ and then a mixture is allowed to stand until no further reaction occurs. The reactions involved are:

$2H^{\oplus} + H_2O_2 + Sn^{2+} \rightarrow Sn^{4+} + 2H_2$

$2H_2O_2 \rightarrow 2H_2O + O_2$

The equivalent of H_2O_2 reacted with Sn^{2+} is

A. 0.2

B. 0.3

C. 0.4

D. 0.6

Answer: D

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26. H_2O_2 is reduced rapidly by Sn^{2+}. H_2O_2 is decomposed slowly at room temperature to yield O_2 and H_2O. $136g$ of $10\,\%$ by mass of H_2O_2 in water is treated with $100mL$ of $3MSn^{2+}$ and then a mixture is allowed to stand until no further reaction occurs. The reactions involved are:

$$2H^{\oplus} + H_2O_2 + Sn^{2+} \rightarrow Sn^{4+} + 2H_2$$

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

The equivalent of H_2O_2 left after reacting with Sn^{2+} is

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer: B

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27. H_2O_2 is reduced rapidly by Sn^{2+}. H_2O_2 is decomposed slowly at room temperature to yeild O_2 and H_2O. $136g$ of $10\,\%$ by mass of H_2O_2 in water is treated with $100mL$ of $3MSn^{2+}$ and then a mixture is allowed to stand until no further reaction occurs. The reactions involved are:

$2H^{\oplus} + H_2O_2 + Sn^{2+} \rightarrow Sn^{4+} + 2H_2$

$2H_2O_2 \rightarrow 2H_2O + O_2$

The volume strength of H_2O_2 left after reacting with Sn^{2+}

A. $1.12V$

B. $11.2V$

C. $2.24V$

D. $22.4V$

Answer: B

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28. H_2O_2 is reduced rapidly by Sn^{2+}. H_2O_2 is decomposed slowly at room temperature to yeild O_2 and H_2O. $136g$ of $10\,\%$ by mass of H_2O_2 in water is treated with $100mL$ of $3MSn^{2+}$ and then a mixture is allowed to stand until no further reaction occurs. The reactions involved are:

$2H^{\oplus} + H_2O_2 + Sn^{2+} \rightarrow Sn^{4+} + 2H_2$

$2H_2O_2 \rightarrow 2H_2O + O_2$

Calculate the volume of O_2 produced at $27^{\circ}C$ and 1 atm after H_2O_2 is reacted with `Sn^(2+) and the mixture is allowed to stand.

A. 2.46 L

B. 4.92 L

C. 1.23 L

D. 7.38 L

Answer: A

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29. Three solutions eaach of 100 mL containing 0.4 M As_2S_3, $5M$ NaOH and $6MH_2O_2$, respectively were mixed to form AsO_4^{3-} and SO_4^{2-} as products.

Q. When the above solution is allowed to stand for some time what volume of O_2 will be obtained STP?

A. 0.112 L

B. 0.224 L

C. 0.224L

D. 0.448L

Answer: C

View Text Solution

30. Three solutions eaach of 100 mL containing 0.4 M As_2S_3, $5M$ NaOH and $6MH_2O_2$, respectively were mixed to form AsO_4^{3-} and SO_4^{2-} as

products.

Q. Percentage strength of the H_2O_2 solution left after reaction is

A. $0.017\ \%$

B. $0.113\ \%$

C. $0.51\ \%$

D. $0.68\ \%$

Answer: C

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31. 100 mL solution of ferric alum $\left[Fe_2(SO_4)_3.\ (NH_4)_2SO_4.24H_2O\right.$ $\left.(Mw = 964gmol^{-1})\right)$ containing $2.41g$ salt was boiled with Fe when the reaction

$Fe + Fe_2(SO_4)_3 \rightarrow 3FeSO_4$

Takes place. The unreacted iron was filtered off and the solution was titrated with $\frac{M}{60}K_2Cr_2O_7$ in acidic medium.

Q. Moles of $FeSO_4$ formed when Fe reacts with $Fe(2)(SO_4)_3$ is

A. 0.0075

B. 0.005

C. 0.001

D. 0.002

Answer: A

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32. 100 mL solution of ferric alum $\left[Fe_2(SO_4)_3.(NH_4)_2SO_4.24H_2O\right.$ $\left.(Mw = 964gmol^{-1})\right)$ containing $2.41g$ salt was boiled with Fe when the reaction

$Fe + Fe_2(SO_4)_3 \rightarrow 3FeSO_4$

Takes place. The unreacted iron was filtered off and the solution was titrated with $\frac{M}{60}K_2Cr_2O_7$ in acidic medium.

Q. Moles of $FeSO_4$ formed when Cu reacts with $Fe_2(SO_4)_3$ is

A. 0.0075

B. 0.005

C. 0.001

D. 0.002

Answer: B

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33. 100 mL solution of ferric alum $\left[Fe_2(SO_4)_3.(NH_4)_2SO_4.24H_2O\right.$ $\left.(Mw = 964gmol^{-1})\right)$ containing $2.41g$ salt was boiled with Fe when the reaction

$Fe + Fe_2(SO_4)_3 \rightarrow 3FeSO_4$

Takes place. The unreacted iron was filtered off and the solution was titrated with $\frac{M}{60}K_2Cr_2O_7$ in acidic medium.

Q. What is the titre value of $K_2Cr_2O_7$ when Fe reacts with $Fe_2(SO_4)_3$?

A. 25 mL

B. 50 mL

C. 75 mL

D. 100 mL

Answer: C

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34. 100 mL solution of ferric alum $\left[Fe_2(SO_4)_3.\ (NH_4)_2SO_4.24H_2O\right.$ $\left.(Mw = 964gmol^{-1})\right)$ containing $2.41g$ salt was boiled with Fe when the reaction

$Fe + Fe_2(SO_4)_3 \rightarrow 3FeSO_4$

Takes place. The unreacted iron was filtered off and the solution was titrated with $\frac{M}{60}K_2Cr_2O_7$ in acidic medium.

Q. What is the titre value of $K_2Cr_2O_7$ when Cu reacts with $Fe_2(SO_4)_3$?

A. 25 mL

B. 50 mL

C. 75 mL

D. 100 ml

Answer: B

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35. 10 mL solution of H_2SO_4 and $H_2C_2O_4$ (oxalic acid), on titration with with 0.1 M KOH, required 20 " mL of " the base. 10 " mL of " the same solution on titration with $\frac{M}{300}K_2Cr_2O_7$ required 50 " mL of " $K_2Cr_2O_7$.

Q. Strength of oxalic acid in the solution is:

A. $4.5gL^{-1}$

B. $4.9gL^{-1}$

C. $2.25gL^{-1}$

D. $2.45gL^{-1}$

Answer: A

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36. 10 mL solution of H_2SO_4 and $H_2C_2O_4$ (oxalic acid), on titration with with 0.1 M KOH, required 20 " mL of " the base. 10 " mL of " the same solution on titration with $\frac{M}{300}K_2Cr_2O_7$ required 50 " mL of " $K_2Cr_2O_7$.

Q. The strength of H_2SO_4 is the solution is:

A. $4.5gL^{-1}$

B. $4.9gL^{-1}$

C. $2.25gL^{-1}$

D. $2.45gL^{-1}$

Answer: B

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37. 10 mL solution of H_2SO_4 and $H_2C_2O_4$ (oxalic acid), on titration with with 0.1 M KOH, required 20 " mL of " the base. 10 " mL of " the same solution on titration with $\frac{M}{300}K_2Cr_2O_7$ required 50 " mL of " $K_2Cr_2O_7$.

Q. What should be the volume strength of $H_2Cr_2O_7$, if H_2O_2 react with the same volume of $\frac{M}{300}K_2Cr_2O_7$ solution.

A. 5.6 V

B. 0.56 V

C. 11.2 V

D. 1.12 V

Answer: B

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38. 10 " mL of " a gaseous organic compound containing C, H and O only was mixed with 100 " mL of " O_2 and exploded under condition which allowed the H_2O formed to condense. The volume of the gas after explosion was 90 mL. On treatment with KOH solution, a further contraction of 20 mL in volume was observed. The vapour density of the compound is 23. All volume measurements were made under the same

condition.

Q.The volume of CO_2 is

A. 20 mL

B. 50 mL

C. 70 mL

D. 90 mL

Answer: A

Watch Video Solution

39. 10 " mL of " a gaseous organic compound containing C, H and O only was mixed with 100 " mL of " O_2 and exploded under condition which allowed the H_2O formed to condense. The volume of the gas after explosion was 90 mL. On treatment with KOH solution, a further contraction of 20 mL in volume was observed. The vapour density of the compound is 23. All volume measurements were made under the same

condition.

Q.The volume of unreacted O_2 is

A. 20 mL

B. 50 mL

C. 70 mL

D. 90 mL

Answer: C

Watch Video Solution

40. 10 " mL of " a gaseous organic compound containing C, H and O only was mixed with 100 " mL of " O_2 and exploded under condition which allowed the H_2O formed to condense. The volume of the gas after explosion was 90 mL. On treatment with KOH solution, a further contraction of 20 mL in volume was observed. The vapour density of the compound is 23. All volume measurements were made under the same

condition.

Q.The molecular formula of the compound is

A. C_3H_8O

B. C_3H_6O

C. C_2H_6O

D. C_2H_4O

Answer: C

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41. Air sample from an industrial area of Delhi, which is heavily polluted by CO_2, was collected and analysed. One such sample of 224 L of air measured at STP was passed through a 500 " mL of " 0.1 M KOH solution, where $CO_2(g)$ was absorbed completely. 50 " mL of " the above solution was then treated with excess of $BaCl_2$ solution where all the carbonate was precipitated as $BaCO_4(s)$. The solution was filtered off and the filtrate required 30 " mL of " 0.1 M HCl solution for neutralisation.

Q. ppm strength of $CO_2(g)$ volume by volume (mL of CO_2 per 10^6 L of air) is

A. 224

B. 2240

C. 100

D. 1000

Answer: D

Watch Video Solution

42. Air sample from an industrial area of Delhi, which is heavily polluted by CO_2, was collected and analysed. One such sample of 224 L of air measured at STP was passed through a 500 " mL of " 0.1 M KOH solution, where $CO_2(g)$ was absorbed completely. 50 " mL of " the above solution was then treated with excess of $BaCl_2$ solution where all the carbonate was precipitated as $BaCO_4(s)$. The solution was filtered off and the filtrate required 30 " mL of " 0.1 M HCl solution for neutralisation.

Q. Calculate the weight of the precipitate of $BaCO_3(s)$ obtained from 50 " mL of " the above test solution. $(Ba = 137, C = 12, O = 16, Mw(BaCO_3) = 137 + 12 + 3 \times 16 = 197gm$

A. 3.94 g

B. 0.394 g

C. 1.97 g

D. 0.197 g

Answer: C

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Exercises Multiple Correct

1. What Volume of 0.1 M $KMnO_4$ in acidic medium is required for complete oxidation of 100 " mL of " 0.1 M $FeCO_2O_4$ and 100 " mL of " 0.1 m ferric oxalate separately.

A. 60 " mL of " $KMnO_4$ with FeC_2O_4

B. 40 mL of $KMnO_4$ with FeC_2O_4

C. 40 mL of $KMnO_4$ with ferric oxalate

D. 120 mL of $KMnO_4$ with ferric oxalate

Answer: A::D

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2. The following reaction takes places in basic medium:

$$\underset{(\text{chromate ion})}{CrO_4^{2-}} + \underset{(\text{Stannite ion})}{HSnO_2^{\ominus}} + H_2O \rightarrow \underset{(\text{stannate ion})}{HSnO_3^{\ominus}} + \underset{(\text{Chromite ion})}{CrO_2^{\ominus}} + \overset{\ominus}{O}H$$

If 400 " mL of " $\frac{M}{5}$ chromate ion react with 500 " mL of " $\frac{M}{4}$ stannite ion, then which of the following statements are correct?

A. Chromate ion CrO_4^{2-} is the limiting reagent.

B. Stannite ion, $HSnO_2^{\ominus}$ is the limiting reagent.

C. At the end of reaction concentration of $CrO_2^{\ominus}$ ions $\approx 0.08M$

D. At the end of reaction concentration of $HSnO_3^{\ominus}$

$\approx 0.13M$

Answer: A::C::D

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3. A solution containing Cu^{2+} and $C_2O_4^{2-}$ ions is titrated with 20 " mL of " $\frac{M}{4}$ $KMnO_4$ solution in acidic medium. The resulting solution is treated with excess of KI after neutralisation. The evolved I_2 is then absorbed is 25 " mL of " $\frac{M}{10}$ hypo solution. Which of the following statements are correct?

A. The difference of the number of m " mol of "Cu^{2+} and $C_2O_4^{2-}$ ions in the solution is 10 m mol

B. The difference of the number of m " mol of "Cu^{2+} and $C_2O_4^{2-}$ ions in the solution is 22.5 m mol.

C. The equivalent weight of Cu^{2+} ions in the titration with KI is equal to the atomic weight of Cu^{2+}

D. The equivalent weight of KI in the titratio is $\frac{M}{2}$ ($M =$ molesular weight of KI)

Answer: A::C

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4. Which of the following statements about the following reaction is/are not correct?

$Cr_2O_7^{2-} + 3H_2O_2 + 8H^{\oplus} \rightarrow 2Cr^{3+} + 7H_2O + 3O_2$

A. H_2O_2 is oxidised to O_2

B. H_2O_2 is reduced to H_2O

C. The oxidation number of chromium atom changes by 3.

D. Hydrogen ions are oxidised to H_2O

Answer: B::D

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5. 100 " mL of " $\frac{M}{10}$ $Ca(MnO_4)_2$ in acidic medium can be oxidised completely with

A. 100 mL of $1MFeSO_4$ solution

B. $\frac{100}{3}$ mL of $1MFeC_2O_4$ solution

C. 25 " mL of " 1 M $K_2Cr_2O_7$ solution

D. 75 " mL of " 1 M $C_2O_4^{2-}$ solution

Answer: A::B

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6. Which of the following statements is/are correct about the reaction.

$4CrO_5 + 6H_2SO_4 \rightarrow 2Cr_2(SO_4)_3 + 6H_2O + 7O_2$

A. It is disproportionation reaction.

B. It is a an intramolecular redox reaction.

C. Cr acts as an oxidant, whereas O acts as a reductant.

D. CrO_5 acts as-oxidant and reductant both.

Answer: B::C::D

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7. 0.1 " mol of "$MnO_4^{\ominus}$ (in acidic medium) can:

A. Oxidise 0.5 " mol of "Fe^{2+}

B. Oxidise 0.166 " mol of "FeC_2O_4

C. Oxidise 0.25 " mol of "$C_2O_4^{2-}$

D. Oxidise 0.6 " mol of "$Cr_2O_7^{2-}$

Answer: A::B::C

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8. $H_2C_2O_4$ and $NaHC_2O_4$ behave as acids as well as reducing agents. Which of the following are correct statements?

A. Equivalents weights of $H_2C_2O_4$ and $NaHC_2O_4$ are equal to their molecular weights when acting as reducing agents.

B. Equivalents weight of $H_2C_2O_4$ and $NaHC_2O_4$ are equal to half their molecular weights when acting as reducing agents.

C. 100 " mL of " 1 M solution of each is neutralised by equal volumes of 1 Nca (OH)_(2)`

D. 100 " mL of " 1 M solution of each is oxidised by equal volumes of 1 M $KMnO_4$.

Answer: B::D

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9. A compound contains three elements A, B and C, if the oxidation number of $A = +2 B = +5$ and $C = -2$ then possible formula of the compound is

A. $A(BC_3)_2$

B. $A_3(BC_4)_2$

C. $A_3(B_4C)_2$

D. ABC_2

Answer: A::B

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10. Choose the correct statement:

A. 1 " mol of " $MnO_4^{\ominus}$ ion can oxidise 5 " mol of " Fe^{2+} ion in acidic medium.

B. 1 " mol of "$Cr_2O_7^{2-}$ ion can oxidise 6 " mol of "Fe^{2+} ion in acidic medium.

C. 1 " mol of "Cu_2S can be oxidised by 1.6 mole of $MnO_4^{\ominus}$ ion in acidic medium.

D. 1 " mol of "CuS can be oxidised by 1 " mol of "$Cr_2O_7^{2-}$ ion in acidic medium.

Answer: A::B::C::D

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11. For the following balanced redox reaction:

$$2MnO_4^{\ominus} + 8H^{\oplus} + Br_2 \rightarrow 2Mn^{2+} + 2BrO_3^{\ominus} + 2H_2O$$

if the molecular weight of $MnO_4^{\ominus} : Br_2$ and Br_2 be $M_1 M_2$ respectively, then

A. equivalent weight of $MnO_4^{\ominus}$ is $\frac{M_1}{5}$

B. Equivalents weight of Br_2 is $\frac{M_2}{10}$

C. The n-factor ratio of $MnO_4^{\ominus}$: $Br_2 is 1:1$

D. none of these

Answer: A::B

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12. Which of the following statements is/are correct about the followig reaction? $Fe_3O_4 \xrightarrow{\Delta} Fe_2O_3$.

A. The equivalent weight of Fe_3O_4 is $M_1 (M_1 =$ molecular weight of $Fe_2O_4)$

B. The equivalent weight of Fe_3O_4 is $\frac{M_1}{3}$.

C. The equivalent weight of Fe_2O_3 is $\frac{3M_2}{2} (M_2 =$ molecular weight of $Fe_2O_3)$.

D. The equivalent weight of Fe_2O_3 is $\frac{M_2}{2}$.

Answer: A::C

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13. Which of the following statements is/are correct about 6.8% stregnth of H_2O_2.

A. Its normality is 4 N

B. Its molarity is 2 M.

C. Its volume strength is 22.4 V.

D. Volume strength $= 11.2 \times M$.

Answer: A::B::C::D

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14. Which of the following reactions is/are not intermolecular redox reaction?

A. $PbO_2 + H_2O \rightarrow PbO + H_2O_2$

B. $2KClO_3 \rightarrow 2KCl + 3O_2$

C. $(NH_4)_2Cr_2O_7 \rightarrow N_2 + Cr_2O_3 + 4H_2O$

D. $NH_4NH_2 \rightarrow N_2 + 2H_2O$

Answer: B::C::D

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15. 1 L sample of impure water containing sulphide ion is made ammoniacal and is titrated with 300 " mL of " 0.1 M $AgNO_3$ solution. Which of the following statements is/are correct about the above reaction?

A. The strength of H_2S in water is $0.51gL^{-1}$

B. The strength of H_2S in water is $5.1gL^{-1}$

C. The concentration of H_2S in water in ppm is 510.

D. The concentration of H_2S in water in ppm is 51.

Answer: A::C

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16. Which of the following statements is/are correct about the reaction.

$$H_2SO_4 + Cu_3P + Cr_2O_7^{2-} \rightarrow CuSO_4 + H_3PO_4 + 2Cr^{3+}$$

A. The number of moles of $Cr_2O_7^{2-}$ required to oxidise 6 " mol of " Cu_3P to $CuSO_4$ and H_2PO_4 is 11 mol.

B. The number of moles of H_2SO_4 used in the reaction is 62.

C. The number of moles of $Cr_2(SO_4)_3$ formed in the reaction is 11.

D. The number of moles of K_2SO_4 formed in the reaction is 11.

Answer: A::B::C::D

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17. Which of the following statements is/are correct in the following reaction.

$$As_2S_5 + NO_3^{\ominus} \rightarrow AsO_4^{3-} + NO_2 + SO_4^{2-}$$

A. The equivalent weight of $As_2S_5 is \frac{M}{40}$. ($M =$ molecular weight of As_2S_5).

B. The equivalent weight of $NO_3^{\ominus} is \frac{M}{3}$.

($M =$ molecular weight of $NO_3^{\ominus}$ ion)

C. n-factor for the conversion of As_2S_5 to AsO_4^{3-} is zero.

D. n-factor for the conversion of As_2S_3 to SO_4^{2-} is 30.

Answer: A::C

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18. In which of the reaction,oxygen is an oxidant.

A. $2F_2 + O_2 \rightarrow 2F_2O$

B. $C + O_2 \rightarrow CO_2$

C. $2C + O_2 \rightarrow 2CO$

D. $2N_2 + O_2 \rightarrow 2N_2O$

Answer: B::C::D

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19. 56.0 g KOH, 138.0 g K_2CO_3 and 100.0 g $KHCO_3$ is dissolved in water and the solution is made 1 L. 10 " mL of " this stock solution is titrated with 2.0 M HCl. Which of the following statements is/are correct?

A. When phenolphthalein is used as an indicator from the very beginning the titre value of HCl will be 60 mL

B. When phenolphthalein is used as an indicator from the very beginning the titre value of HCl will be 40 mL.

C. When methyl orange is used as an indicator from the very beginning, the titre value of HCl will be 80 mL.

D. When methyl orange is used as an indicator after the first end point the titre value of HCl will be 30 mL.

Answer: B::C::D

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20. xg of H_2O_2 requires $100mL$ of $M/5KMnO_4$ in a titration in a solution having $pOH = 1.0$ Which of the following is/are correct?

A. the value of x is 1.7 g

B. the value of x is 0.34 g

C. $MnO_4^{\ominus}$ changes to MnO_4^{2-}

D. H_2O_2 changes to O_2.

Answer: B::C::D

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21. A mixture of n_1 moles of $Na_2C_2O_4$ and $NaHC_2O_4$ is titrated separately with H_2O_2 and KOH, to reach at equivalence point. Which of the following statement is/are correct?

A. Moles of H_2O_2 and KOH are $n_1 + n_2$ and n_2

B. Moles of H_2O_2 and KOH is $n_1 + \frac{n_2}{2}$ and n_1

C. n-factors of $NaHC_2O_4$ with KOH and H_2O_2, respectively, are 1 and 2.

D. n-factors of $Na_2C_2O_4$ with H_2O_2 and KOH, respectively, are 2 and 1.

Answer: A::C

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22. 100 " mL of " 0.2 M Kal$(OH)_2CO_3$ solution is completely neutralised by a standard solution of $\frac{M}{4}H_2C_2O_4$. Which of the following is/are wrong?

A. The volume of $H_2C_2O_4$ required is 160 mL.

B. the volume of $H_2C_2O_4$ required 80 mL.

C. The normality of $KAl\ (OH)_2CO_3$ is 0.4 N

D. It is a redox reaction.

Answer: B::C::D

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23. Which of the following is/are correct about the redox reaction?

$MnO_4^{\ominus} + S_2O_3^{2-} + H^{\oplus} \rightarrow Mn^{+2} + S_4O_6^{2-}$

A. 1 " mol of "$S_2O_3^{2-}$ is oxidised by 8 " mol of "$MnO_4^{\ominus}$

B. The above redox reaction with the change of pH from 4 to 10 will have an effect on the stoichiometry of the reaction.

C. Change of pH form 4 to 7 will change the nature of the product.

D. At $pH = 7$, $S_2O_3^{2-}$ ions are oxidised to $HSO_4^{\ominus}$

Answer: B::C::D

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24. 20 " mL of " H_2O_2 is reacted completely with acidified $K_2Cr_2O_7$ solution 40 " mL of " $K_2Cr_3O_7$ solution was required to oxidised the H_2O_2 completely. Also, 2.0 " mL of " the same $K_2Cr_2O_7$ solution required 5.0 " mL of " a 1.0 M $H_2C_2O_4$ solution to reach equivalence point. Which of the following statements is/are correct?

A. The H_2O_2 solution is 5 M.

B. The volume strength of H_2O_2 is 56V.

C. The volume strength of H_2O_2 is 112V.

D. If 40 " mL of " $\frac{5M}{8H_2O_2}$ is further added to the 10 " mL of " above H_2O_2 solution the volume strength of the resulting solution is changed to 16.8 V.

Answer: A::B::D

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25. Three different solution of oxidising agents. $K_2Cr_2O_7, I_2,$ and $KMnO_4$ is titrated separately with $0.19gofK_2S_2O_3$. The molarity of each oxidising agent is 0.1 M and the reaction are:

(i). $Cr_2O_7^{2-} + S_2O_3^{2-} \rightarrow Cr^{3+} + SO_4^{2-}$

(ii). $I_2 + S_2O_3^{2-} \rightarrow I^{\ominus} + S_4O_6^{2-}$

(iii). $MnO_4^{\ominus} + S_2O_3^{2-} \rightarrow MnO_2 + SO_4^{2-}$

(Molecular weight of $K_2S_2O_3 = 190, K_2Cr_2O_7 = 294, KMnO_4 = 158,$ and $I_2 = 254mol^{-1}$)

Which of the following statements is/are correct?

A. All three oxidising agents can act as self-indicators

B. Volume of I_2 used in minimum.

C. Volume of $K_2Cr_2O_7$ used in maximum.

D. weight of $KMnO_4$ used in the titration is maximum.

Answer: A::B::D

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26. Consider the following reaction:

$KClO_3(s) \xrightarrow{\Delta} KCl(s) + O_2(g)$, yield $= 60\,\%$

$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$, yield $= 50\,\%$

$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$, yield $= 50\,\%$

What volume of 0.2 M H_2SO_4 solution is required to produce enough H_2 to completely react with O_2 liberated due decomposition of $1.225 g KClO_3$.

(Molecular weight of $KClO_3 = 39 + 53.5 + 3 \times 16$

$= 122.5 g mol^{-1}$)

A. 150 mL

B. 180 mL

C. 360 mL

D. 480 mL

Answer: B

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27. 2.0 g of an elements is reacted with aqueous solution containing KOH and KNO_3 to yield K_2XO_2 and NH_3. NH_3 thus liberated is absorbed in 200 " mL of " 0.05 M H_2SO_4. The excess acid required 10 " mL of " 1.5 M $NaOH$ for complete neutralisation Which of the following statements is/are correct?

A. The atomic weight of X is 100 g

B. The equivalent weight of X is 50 g

C. The equivalent weight of X is 25 g

D. The atomic weight of X is 200 g

Answer: A::B

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28. Permanent hardness is due to $CI^{\ominus}$ and SO_4^{2-} of Mg^{2+} and Ca^{2+} and is removed by adding Na_2CO_3.

$CaSO_4 + Na_2CO_3 \rightarrow CaCO_3 + Na_2SO_4$
$CaCl_2 + Na_2CO_3 \rightarrow CaCO_3 + 2NaCl$

Which of the following statements is / are correct?

A. If hardness is 100 ppm $CaCO_3$ the amount of Na_2CO_3 requried to soften 10 L of hard water is 10.6 g.

B. If hardness is 100 ppm $CaCO_3$, the amount of Na_2CO_3 required to soften 10 L of hard is 10.6 g

C. If hardness is 420 ppm $MgCO_3$, the amount of Na_2CO_3 required to soften 10 L of hard water is 53.0 g.

D. If hardness is 420 ppm $MgCO_3$ the amount of Na_2CO_3 required to soften 10 L of hard water is 5.3 g.

Answer: A::D

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29. The hardness of water due to HCO_3 is $122ppm$. Select the correct statement(s).

A. The hardness of water in terms of $CaCO_3$ is 200 ppm.

B. The hardness of water in terms of $CaCO_3$ is 100 ppm.

C. The hardness of water in terms of $CaCl_2$ is 222 ppm.

D. The hardness of water in terms of $MgCl_2$ is 95 ppm.

Answer: B::D

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30. 18 " mL of " 1.0 M Br_2 solution undergoes complete disproportionation in basic medium to $Br^{The hard \neq s so f water \in terms of}$ and $BrO_3^{\ominus}$. Then the resulting solution required 45 " mL of " As^{3+} solution to reduce $BrO_3^{\ominus}$ to $Br^{\ominus}$. As^{3+} is oxidised to As^{5+} which statements are correct?

A. $Ew(Br_2) = \frac{M}{10}$

B. $Ew(Br_2) = \frac{5M}{3}$

C. Molarity of $As^{+3} = 0.4M$

D. Molarity of $As^{3+} = 0.2M$

Answer: B::C

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Exercises Single Correct

1. 34 g of H_2O_2 is present in 1120 " mL of " solution. This solution is called

A. 10 vol solution

B. 20 vol solution

C. 34 vol solution

D. 32 vol solution

Answer: A

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2. A 5.0 mL solution of H_2O_2 liberates 1.27 g of iodine from an acidified KI solution. The percentage strenth of H_2O_2 is

A. 11.2

B. 5.6

C. 1.7

D. 3.4

Answer: D

Watch Video Solution

3. If 20 " mL of " 0.1 M $K_2Cr_2O_7$ is required to titrate 10 " mL of " a liquid iron supplement, then the concentration of iron in the the the vitamin

solution is

A. 1.2 M

B. 2.4 M

C. 0.6 N

D. 1.56 M

Answer: A

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4. If an ore sample containing Mn, is treated with $50mL$ of $0.2750MNa_2C_2O_4$ and the unreacted $Na_2C_2O_4$ required $18.28mL$ of $0.1232MKMnO_4$ in acidic medium,then the number of moles of Mn in the ore is

A. 1.38×10^{-2}

B. 1.49×10^{-3}

C. 1.15×10^{-2}

D. 8.12×10^{-3}

Answer: D

Watch Video Solution

5. After 20 " mL of " 0.1 M $Ba(OH))_2$ is mixed with 10 " mL of " 0.2 M $HClO_4$, the concentration of $\overset{\ominus}{O}H$ ions is

A. $2 \times 10^{-3} M$

B. 10^{-3}M

C. 0.066 M

D. $\overset{\ominus}{O}H$ ions are completely neutralised.

Answer: C

Watch Video Solution

6. K_2CrO_4 oxidises KI in the presence of KCl to I_2. The equivalent weight of the K_2CrO_4 is

A. $\frac{Mw}{2}$

B. $Mw \times \frac{2}{3}$

C. $\frac{Mw}{3}$

D. $\frac{Mw}{6}$

Answer: C

Watch Video Solution

7. The pH of $10^{-5}MHCI$ solution if $1mol$ of it is diluted to $1000ml$ is :

A. 5

B. 8

C. 7.02

D. 6.98

Answer: D

Watch Video Solution

8. What volume of 0.1 M $KMnO_4$ is needed to oxidise 5 " mg of " ferrous oxalate in acidic medium (Mw of ferrous oxalate is 144.)

A. 0.20 mL

B. 0.1 mL

C. 0.4 mL

D. 2.08 mL

Answer: A

Watch Video Solution

9. 4 " mol of "a solution containing A^{n+} requried 1.6 mon of $MnO_4^{\ominus}$ for the oxidation to A^{n+} to $AO_3^{\ominus}$ in acidic medium. The value of n is

A. 1

B. 2

C. 3

D. 4

Answer: C

Watch Video Solution

10. One mole of N_2H_4 loses ten moles of electrons to form a new compound A. Assuming that all the nitrogen appears in the new compound, what is the oxidation state of nitrogen in A? (There is no change in the oxidation state of hydrogen.)

A. $+1$

B. -3

C. $+3$

D. $+5$

Answer: C

Watch Video Solution

11. $100mL$ of ozone at STP was passed through $100mL$ of 10 volume H_2O_2 solution. What is the volume strength of H_2O_2 after attraction?

A. 9.5

B. 9

C. 4.75

D. 4.5

Answer: A

Watch Video Solution

12. 10 " mL of " a solution of H_2O_2 of 10 violume strength decolourises 100 " mL of " $KMnO_4$ solution acidified with dil H_2SO_4. The amount of

$KMnO_4$ in the given solution is $K = 39, Mn = 55$)

A. 0.282 g

B. 0.564 g

C. 1.128g

D. 0.155 g

Answer: B

View Text Solution

13. $25mL$ samples of distiled water, tap water and boiled water required, respectively, $1mL$, $13mL$ and $5mL$ of soap solution to form a permanent lather. The ratio of temporary to permanent hardness in the tap water is

A. $3:2$

B. $2:3$

C. $1:2$

D. $2:1$

Answer: D

Watch Video Solution

14. $3.4g$ sample of H_2O_2 solution containing $x\,\%\,H_2O_2$ by weight requires $xmLofaKMnO_4$ solution for complete oxidation under acidic condition. The normality of $KMnO_4$ solution is

A. 1N

B. 2N

C. 3N

D. 0.5N

Answer: B

Watch Video Solution

15. If $100mL$ of acidified $2NH_2O_2$ is allowed to react with $KMnO_4$ solution till there is light tinge of purples colour, the volume of oxygen produced at STP is :

A. 2.24 L

B. 1.12 L

C. 3.36 L

D. 4.48 L

Answer: A

Watch Video Solution

16. In the following equation

$$CrO_4^{2-} + S_2O_3^{2-} + \overset{\ominus}{O}H \rightarrow \left[Cr(OH)_4\right]^{-1} + SO_4^{2-}$$

What volume of 0.2 M $Na_2S_2O_3$ solution.

A. 30 mL

B. 80 mL

C. 20 mL

D. 60mL

Answer: B

View Text Solution

17. 0.7 g sample of iron ore was dissolved in acid. Iron was reduced to $+2$ state and it required 50 " mL of " $\frac{M}{50}$ $KMnO_4$ solution for titration. The percentage of Fe and Fe_3O_4 in the ore is

A. $40\ \%\ Fe$, $55.24\ \%$, Fe_3O_4

B. $55.24\ \%\ Fe$, $40\ \%\ Fe_3O_4$

C. $8\ \%\ Fe$, $11\ \%\ Fe_3O_4$

D. $11\ \%\ Fe$, $8\ \%\ Fe_3O_4$

Answer: A

Watch Video Solution

18. $0.50g$ of a mixture of K_2CO_3 and Li_2CO_3 required $30mL$ of $0.25NHCl$ solution for neutralization. What is $\%$ composition of mixure?

A. $96\ \% K_2CO_3, 4\ \% Li_2CO_3$

B. $4\ \% K_2CO_4, 96\ \% Li_2CO_3$

C. $48\ \% K_2CO_3, 52\ \% Li_2CO_3$

D. $52\ \% K_2CO_3, 48\ \% Li_2CO_3$

Answer: A

Watch Video Solution

19. In the estimation of nitrogen by Kjeldahl's method, 2.8 g of an organic compound required 20 millimoles of H_2SO_4 for the complete neutralisation of NH_3 gas evolved. The percentage of nitrogen in the sample is

A. $20\ \%$

B. $10\ \%$

C. $40\ \%$

D. $30\ \%$

Answer: A

Watch Video Solution

20. 0.3 g of platinichloride of an organic diacidic base left 0.09 g of platinum on ignition. The molecular weight of the organic base is

A. 120

B. 240

C. 180

D. 60

Answer: B

Watch Video Solution

21. 0.5 g of an organic substance containing phosphorus was heated with conc HNO_3 in the carius tube, the phosphoric acid thus formed was precipitated with magnesia mixture $(MgNH_4PO_4)$ which on ignition gave a residue to 1.0 g of megnesium pyrophosphate $(Mg_2P_2O_7)$ The percentage of phosphorous in the organic compound is

A. $55.85\ \%$

B. $29.72\ \%$

C. 19.81%`

D. $20.5\ \%$

Answer: A

Watch Video Solution

22. A bolloon blown up has a volume of 300 mL at 27% C. The balloon is distended to $\frac{5}{6}$ of its maximum stretching capacity. The maximum temperature above which it will burst is

A. $77^\circ C$

B. $67^\circ C$

C. $57^\circ C$

D. $87^\circ C$

Answer: D

Watch Video Solution

23. The number of moles of $KMnO_4$ that will be needed to react completely with one mole of ferrous oxalate in acidic solution is:

A. $\frac{1}{5}$

B. $\frac{2}{5}$

C. $\frac{3}{5}$

D. $\frac{5}{3}$

Answer: C

Watch Video Solution

24. In a reaction, 4 mole of electrons are transferred to 1 mole of HNO_3, the possible product obtained due to reduction is:

A. 0.5 mol of N_2

B. 0.5 mol of N_2O

C. 1 mol of NO_2

D. 1 mol of NH_3

Answer: B

Watch Video Solution

25. If equal volumes of $0.1MKMnO_4$ and $0.1MK_2Cr_2O_7$ solutions are allowed to oxidise Fe^{2+} to Fe^{3+} in acidic medium, then Fe^{2+} oxidised will be:

A. More by $KMnO_4$

B. More by $K_2Cr_3O_7$

C. Equal in both cases

D. Can't be determined

Answer: B

Watch Video Solution

26. Sulphuryl chloride SO_2Cl_2 reacts with water to give a mixture of H_2SO_4 and HCl. Moles of $NaOH$ requried to neutralise the solution formed by adding 1 " mol of "SO_2Cl_2 to excess water is are

A. 1

B. 2

C. 3

D. 4

Answer: D

Watch Video Solution

27. 100 " mL of " 0.01 M $KMnO_4$ oxidised 100 mL H_2O_2 in acidic medium. The volume of same $KMnO_4$ required in strong alkaline medium to oxidise 100 " mL of " same H_2O_2 will be:

A. $\frac{100}{3}mL$

B. $\frac{500}{3}mL$

C. $\frac{300}{5}mL$

D. None

Answer: B

Watch Video Solution

28. $10mL$ of H_2O_2 solution (volume strength $= x$) requires $10mL$ of $N/0.56MnO_4^{\ominus}$ solution in acidic medium. Hence$x$ is

A. 0.56

B. 5.6

C. 0.1

D. 10`

Answer: D

Watch Video Solution

29. $4I^- + Hg^{2+} \rightarrow HgI_4^{2-}$, 1 mole each of Hg^{2+} and I^- will form..... Mole HgI_4^{2-}:

A. 1 mol

B. 0.5 mol

C. 0.25 mol

D. 2 mol

Answer: C

Watch Video Solution

30. When 1×10^{-3} " mol of "the chloride of an elements Y was completely hydrolysed, it was found that the resulting wsolution requried 20 " mL of " 0.1 M aqueous silver nitrate for complete precipitation of the chloride ion. Elements Y could be

A. Aluminium

B. Phosphorus

C. Silicon

D. Sulphur

Answer: D

Watch Video Solution

31. In the mixture of $(NaHCO_3 + Na_2CO_3)$ volume of HCl required is x mL with phenolphthalein indicator and then y mL with methyl orange indicator in same titration Hence, volume of HCl for complete reaction of Na_2CO_3 is

A. $2x$

B. y

C. $\frac{x}{2}$

D. $(y - x)$

Answer: A

Watch Video Solution

32. Equivalent weight of $MnO_4^{\ominus}$ in acidic neutral and basic media are in ratio of:

A. $3:4:15$

B. $5:3:1$

C. $5:1:13$

D. $3:15:5$

Answer: A

Watch Video Solution

33. $NH_3 + Ocl^{\ominus} \rightarrow N_2H_2 + Cl^{\ominus}$

On balancing the above equation in basic solution, using integral coefficient, which of the following whole number of will be the coefficient of N_2H_4?

A. 1

B. 2

C. 3

D. 4

Answer: A

Watch Video Solution

34. $50mL$ of $0.1M$ solution of a salt reacted with $25mL$ of $0.1M$ solution of sodium sulphite. The half reaction for the oxidation of sulphite ion is:

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

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

A. 0

B. 1

C. 2

D. 4

Answer: C

Watch Video Solution

35. 20 " mL of " x M HCl neutralises completely 10 " mL of " 0.1 M $NaHCO_3$ solution and a further 5 " mL of " 0.2 M Na_2CO_3 to methyl orange end point. What is the value of x?

A. 0.167 M

B. 0.133 M

C. 0.15 M

D. 0.2 M

Answer: C

Watch Video Solution

36. Atomic weight of barium is 137.34 The equivalent weight of barium is $BaCrO_4$ used an an oxidising agent in acid medium is

A. 137.34

B. 45.78

C. 114.45

D. 68.67

Answer: B

Watch Video Solution

37. The normality and volume strength of a solution made by mixing $1.0L$ each of 5.6 volume and 11.2 volume H_2O_2 solution are:

A. $1N$, $5.6vol$

B. $1.5N$, $5.6vol$

C. $1.5N$, $8.4vol$

D. $1N, 8.4vol$

Answer: C

Watch Video Solution

38. 36 " mL of " 0.5 M Br_2 solution when made alkaline undergoes complete disproportionation into $Br^{\ominus}$ and $BrO_3^{\ominus}$. The resulting solution requried 45 " mL of " As (III) solution to reduce $BrO_3^{\ominus}$ to $Br^{\ominus}$. Given that as (III) is oxidised to As (V), what is the molarity of As (III) solution?

A. 0.2

B. 0.1

C. 0.4

D. 0.5

Answer: C

Watch Video Solution

39. RH_2 (ion exchange resin) can replace Ca^{2+} d in hard water as.

$RH_2 + Ca^{2+} \rightarrow RCa + 2H^+$

1litre of hard water passing through RH_2 has $pH2$. Hence hardness in $ppm\text{of}Ca^{2+}$ is:

A. 200

B. 100

C. 50

D. 125

Answer: A

Watch Video Solution

40. $100mL$ of H_2O_2 is oxidised by $100mL$ of $0.01MKMnO_4$ in acidic medium $\left(MnO_4^{\ominus}\right.$ reduced to Mn^{2+}). $100mL$ of the same H_2O_2 is oxidised by VmL of $0.01MKMnO_4$ in basic medium. Hence V is

A. 500

B. 100

C. $\frac{100}{3}$

D. $\frac{500}{3}$

Answer: D

Watch Video Solution

41. F_2 can be prepared by reacting hexfluoro magnante (IV) with antimony pentafluoride as:

$K_2KnF_6 + SbF_5 \xrightarrow{150^\circ C} KSbF_6 + MnF_3 + F_2$ ltBrgt The number of equivalent of K_2MnF_6 requried to react completely with one " mol of " SbF_5 in the given reaction is

A. 1.52

B. 5.0

C. 0.5

D. 4.0

Answer: C

Watch Video Solution

42. 3 " mol of "a mixture of $FeSO_4$ and $Fe_2(SO_4)_3$ requried 100 " mL of " 2 M $KMnO_4$ solution in acidic medium. Hence, mole fraction of $FeSO_4$ in the mixture is

A. $\frac{1}{3}$

B. $\frac{2}{3}$

C. $\frac{2}{5}$

D. $\frac{3}{5}$

Answer: D

Watch Video Solution

43. $28NO_3^- + 3As_2S_3 + 4H_2O \rightarrow 6AsO_4^{3-} + 28NO + 9SO_4^{2-} + H^+$

What will be the equivalent mass of As_(2)S_(3)` in the above reaction?

A. $\frac{3M}{28}$

B. $\frac{M}{4}$

C. $\frac{M}{24}$

D. $\frac{M}{28}$

Answer: D

Watch Video Solution

44. Which of the following reaction is oxidation- reduction?

A. $H^{\oplus} + OH^{\ominus} \rightarrow H_2O$

B. $\frac{1}{2}H_2 + \frac{1}{2}Cl_2 \rightarrow HCl$

C. $CaCO_3 \rightarrow CaO + CO_2$

D. (a) and (c)

Answer: B

Watch Video Solution

45. For the reaction

$M^{x+} + MnO_4^{\ominus} \rightarrow MO_3^{\ominus} + Mn^{2+} + (1/2)O_2$

if $1\text{mol of}MnO_4^{\ominus}$ oxidises $1.67\text{mol of}M^{x+}\text{to}MO_3^{\ominus}$, then the value of x in the reaction is

A. 2

B. 3

C. 4

D. 5

Answer: A

Watch Video Solution

46. In the mixture of $(NaHCO_3 + Na_2CO_3)$ volume of HCl required is x mL with phenolphthalein indicator and then y mL with methyl orange indicator in same titration Hence, volume of HCl for complete reaction of Na_2CO_3 is

A. $2x$

B. y

C. $\frac{x}{2}$

D. $(y - x)$

Answer: D

Watch Video Solution

47. Which of the following does not represent redox reaction?

A. $Cr_2O_7^{2-} + 2\overset{\ominus}{O}H \rightarrow CrO_4^{2-} + H_2O$

B. $SO_5^{2-} + 2I^{\ominus} + 2H^{\oplus} \rightarrow I_2 + SO_4^{2-}$

C. $2Ca(OH)_2 + 2Cl_2 \rightarrow Ca(ClO)_2 + CaCl_2 + 2H_2O$

D. $PCl_5 \rightarrow PCl_3 + Cl_2$

Answer: A

Watch Video Solution

48. 10 " mL of " $NaHC_2O_4$ is oxidised by 10 " mL of " 0.02 M $MnO_4^{\ominus}$. Hence, 10 " mL of " $NaHC_2O_4$ is neutralised by

A. 10 " mL of " 0.1 M NaOH

B. 10 " mL of " 0.02 M NaOH

C. 10 " mL of " 0.1 M $Ca(OH)_2$

D. 10 " mL of " 0.05 N $Ba(OH)_2$

Answer: A

Watch Video Solution

49. 1 mole of ferric oxalate is oxidised by x mole of MnO_4^- in acidic medium, Hence value of x is:

A. 1.2

B. 1.6

C. 1.8

D. 1.5

Answer: A

Watch Video Solution

50. $2\text{mole}N_2$ and $3\text{mole}H_2$ gas are allowed to react in a $20L$ flask at $400K$ and after complete conversion of H_2 into NH_3. $10LH_2O$ was added and temperature reduced to $300K$. Pressure of the gas after reaction is :

$N_2 + 3H_2 \rightarrow 2NH_3$

A. $3R \times \frac{300}{20}$

B. $3R \times \frac{300}{10}$

C. $R \times \frac{300}{20}$

D. $R \times \frac{300}{10}$

Answer: D

Watch Video Solution

51. $K_2Cr_2O_7$ is obtained in the following steps:

$2FeCrO_4 + 2Na_2CO_3 + O \rightarrow Fe_2O_3 + 2Na_2CrO_4 + 2CO_2$

$2Na_2CrO_4 + H_2SO_4 \rightarrow Na_2Cr_2O_7 + H_2O + Na_2SO_4$

$Na_2Cr_2O_7 + 2KC < oK_2Cr_2 + 2NaCl$

To get 0.25 " mol of "$K_2Cr_2O_7$," mol of "$50\ \%$ pure $FeCrO_4$ required.

A. 1 mol

B. 0.50 mol

C. 0.25 mol

D. 0.125 mol

Answer: A

Watch Video Solution

52. $40mL0.05M$ solution of sodium sesquicarbonate dehydrate $(Na_2CO_3.NaHCO_3.2H_2O)$ is titrated against $0.05MHCl$ solution, xmL of acid is required to reach the phenolphthalein end point while mL of same acid were required when methyl organe indicator was used in a separate titration. Which of the following is (are) correct statements?

a. $y - x = 80mL$

b. $y + x = 160mL$

c. If the titration is started with phenolphthalein indicator and methyl orange is added at the end point, $2xmL$ of HCl would be required further to reach the end point

d. If the same volume of same solution is titrated against $0.10MNaOH$, $x/2mL$ of base would be required

A. `80 mL

B. 30 mL

C. 120 mL

D. none

Answer: A

Watch Video Solution

53. What volume of 0.05 M $K_2Cr_2O_7$ in acidic medium is needed for completel oxidation of 200 " mL of " 0.6 M FeC_2O_4 solution?

A. 1.2 mL

B. 1.2 L

C. 120 mL

D. 800 mL

Answer: B

Watch Video Solution

54. MnO_4^{2-} (1 mole) in neutral aqueous medium is disproportionate to

A. $\frac{2}{3}$ mol of $MnO_4^{\ominus}$ and $\frac{1}{3}$ mol of MnO_2

B. $\frac{1}{3}$ mol of $MnO_4^{\ominus}$ and $\frac{2}{3}$ mol of MnO_2

C. $\frac{1}{3}$ mol of Mn_2O_7 and $\frac{2}{3}$ mol of MnO_2

D. $\frac{2}{3}$ mol of Mn_2O_7 and $\frac{1}{3}$ mol of MnO_2

Answer: A

Watch Video Solution

55. If equal volumes of $0.1MKMnO_4$ and $0.1MK_2Cr_2O_7$ solutions are allowed to oxidise Fe^{2+} to Fe^{3+} in acidic medium, then Fe^{2+} oxidised will be:

A. More by $K_2Cr_2O_7$

B. More by $KMnO_4$

C. Equal in both cases

D. The data is insufficient to predict the answer

Answer: A

Watch Video Solution

56. 100mL of 1M $KMnO_4$ oxidised 100mL of H_2O_2 in acidic medium (when MnO_4^- is reduced to Mn^{2+}) , voluem of same $KMnO_4$ required to oxidise 100mL of H_2O_2 in basic medium (when MnO_4^- is reduced to MnO_2) will be :

A. $\frac{100}{3}mL$

B. $\frac{500}{3}mL$

C. $\frac{300}{5}mL$

D. none of these

Answer: D

Watch Video Solution

57. The volume strength of $1.5NH_2O_2$ solution is

A. 4.8

B. 8.4

C. 3

D. 8

Answer: B

Watch Video Solution

58. The equivalent weight of $MnSO_4$ is half its molecular weight when it is converted to

A. Mn_2O_3

B. MnO_2

C. $MnO_4^{\ominus}$

D. MnO_4^{2-}

Answer: B

Watch Video Solution

59. What volume of 0.2 M $KMnO_4$ is required to react with 1.58 g of hypo solution $(Na_2S_2O_3)$ in acidc medium?

A. 20 mL

B. 10 mL

C. 16.6 mL

D. 50 mL

Answer: B

Watch Video Solution

60. Certain " mol of "HCn is oxidised completely by 25 " mL of " $KMnO_4$. The products are CO_2 and $NO_3^{\ominus}$ ion. When all CO_2 is passed through

lime water , 1 g of $CaCO_3$ is obtained the molarity of the $KMnO_4$ used is

A. 1.44 M

B. 0.72 M

C. 036 M

D. none of these

Answer: D

Watch Video Solution

61. 1.6 g of pyrolusite ore was treted with 50 " mL of " 1.0 N oxalic acid and some sulphuric acid. The oxalic acid left undecomposed was raised to 250 mL in a flask. 25 " mL of " this solution, when titrated with 0.1 N $KMnO_4$ required 32 " mL of " this solution. Find out the percentage of pure MnO_2 and also the percentage of available oxygen from MnO_2.

A. $10.86\ \%$

B. $5.43\ \%$

C. $1.086\ \%$

D. none of these

Answer: B

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62. In basic medium CrO_4^{2-} reacts with $S_2O_3^{2-}$ resulting in the formation of $Cr_{OH\_}(4)^{\ominus}$ and SO_4^{2-} How many " mL of " 0.1 M Na_2CrO_4 is required to react with 40 " mL of " 0.25 M $Na_2S_2O_3$?

A. $240.2mL$

B. $24.02mL$

C. $266.65mL$

D. 26.67mL

Answer: C

Watch Video Solution

63. KI reacts with H_2SO_4 producing I_2 and H_2S the volume of 0.2 M H_2SO_4 required to produce 0.1 " mol of "H_2S is

A. 4 L

B. 2.5 L

C. 3.8 L

D. 5 L

Answer: B

Watch Video Solution

64. A 0.46 g sample of As_2O_3 required 25.0 " mL of " $KMnO_4$ solution for its titration. The molarity of $KMnO_4$ solution for its titration. The molarity of $KMnO_3$ solution is

A. 0.016

B. 0.074

C. 0.032

D. 0.128

Answer: B

Watch Video Solution

65. The number of moles of $K_2Cr_2O_7$ reduced by $1mol$ of Sn^{2+} ions is

A. $\frac{1}{3}$

B. $\frac{1}{6}$

C. $\frac{2}{3}$

D. 1

Answer: A

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66. $10mL$ of H_2O_2 solution (volume strength $= x$) requires $10mL$ of $N/0.56MnO_4^{\ominus}$ solution in acidic medium. Hence$x$ is

A. 0.56

B. 5.6

C. 0.1

D. 10

Answer: D

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67. Equivalent weight of H_3PO_2 when it disproportionates into PH_3 and H_3PO_3 is (mol.wt. of $H_3PO_2 = M$)

A. M

B. $\frac{M}{2}$

C. $\frac{M}{4}$

D. $\frac{3M}{4}$

Answer: D

Watch Video Solution

68. What volume of 0.1 M $Ca(OH)_2$ will be required neutralise 200 " mL of " 0.2 M H_2SO_3 using methyl red indicator to change the colour form pihnk (acidic medium) to yellow (basic medium)?

A. 300 mL

B. 200 mL

C. 100 mL

D. 30 mL

Answer: 2

Watch Video Solution

69. What volume of 0.1 M $Ca(OH)_2$ will be required to neutralise 200 " mL of " 0.2 M H_2SO_3 using methyl orange indicator to change the colour from red (acidic medium) to yello (basic medium)?

A. $200mL$

B. $400mL$

C. $20mL$

D. $40mL$

Answer: A

Watch Video Solution

70. What volume of 0.2 M KOH will be requried to neutralise 100 " mL of " 0.1 M H_3PO_4 using methyl red indicator (change of colour pink $\rightarrow$ yellow) and then bromothymol blue indicator is added.

A. 50 mL

B. 100 mL

C. 150 mL

D. 200 mL

Answer: B

Watch Video Solution

71. What volume of 0.1 M $Ba(OH)_2$ will be required to neutralise a mixture of 50 " mL of " 0.1 M HCl and 100 " mL of " 0.2 M H_3PO_4 using methyl red indicator?

A. 25 mL

B. 50 mL

C. 100 mL

D. 125 mL

Answer: D

Watch Video Solution

72. When 100 " mL of " 0.1 M $Ba(OH)_2$ is neutralised with a mixture of x " mL of " 0.1 M HCl and y " mL of " 0.2 M H_2SO_3 using methyl orange indicator what is value of x and y?

A. 200100

B. 100200

C. 300200

D. 200300

Answer: A

Watch Video Solution

73. If $10g$ of V_2O_5 is dissolved in acid and is reduced to V^{2+} by zinc metal, how many mole I_2 could be reduced by the resulting solution if it

is further oxidised to VO^{2+} ions? [Assume no change in state of Zn^{2+} ions] ($V = 51, O = 16, I = 127$)

A. 0.11 " mol of "I_2

B. $0.22 \text{ mol of } I_2$

C. $0.055 \text{ mol of } I_2$

D. $0.44 \text{ mol of } I_2$

Answer: A

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74. The volume of 0.5 M H_3PI_4 that completely dissolved 3.1 g of copper carbonate is (molecular mass of copper carbonate $= 124 gmol^{-1}$)

A. 55.5 mL

B. 45.5 mL

C. 35.5 mL

D. 33.3 mL

Answer: D

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75. 1 g of a sample of NaOH was dissolved in 50 " mL of " 0.33 M alkaline solution of $KMnO_4$ and refluxed till all the cyanide was converted into $OCN^{\ominus}$. The reaction mixture was cooled and its 5 mL portion was acidified by adding H_2SO_4 in excess and then titrated to end point against 19.0 " mL of " 0.1 M $FeSO_4$ solution. The percentage purity of NaCN sample is

A. $55.95\ \%$

B. $65.95\ \%$

C. $75.95\ \%$

D. $85.95\ \%$

Answer: C

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76. 0.4 g of polybasic acid HnA (all the hydrogens are acidic) requries 0.5 g of NaOH for complete neutralisation. The number of replaceable hydrogen atoms and the molecular weight of A would be (Mw of $acid = 96$)

A. $2, 94$

B. $1, 95$

C. $3, 93$

D. $4, 92$

Answer: D

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77. A mixutre solution of KOH and Na_2CO_3 requires 15 " mL of " $\frac{N}{20}$ HCl when titrated with phenolphthalein as indicator.But the same amoound

of the solutions when titrated with methyl orange as indicator requires 25 " mL of " the same acid. Calculate the amount of KOH and Na_2CO_3 present in the solution.

A. 0.014 g

B. 0.14 g

C. 0.028 g

D. 1.4 g

Answer: A

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78. 25.0 g of $FeSO_4.7H_2O$ was dissolved in water containing dilute H_2SO_4 and the volume was made up to 1.0 L. 25.0 " mL of " this solution requried 20 " mL of " an $\frac{N}{10}$ $KMnO_4$ solution for complete oxidation the percentage of $FeSO_47H_2O$ in the acid solution is

A. $78\ \%$

B. $98\ \%$

C. $89\ \%$

D. $79\ \%$

Answer: C

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79. A 0.13 g of a specimen containing MnO_2 is treated with iodide ions. If iodine liberated requires 30.0 " mL of " 0.075 M solution of $Na_2S_2O_3$, the percentage of MnO_2 in the mineral is

A. $75.3\ \%$

B. $85.3\ \%$

C. $95.3\ \%$

D. none

Answer: A

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80. The mass of $K_2Cr_2O_7$ required to produce 5.0 L CO_2 at $77^\circ C$ and 0.82 atm pressure from excess of oxalic acid and volume of 0.1 N $NaOH$ required to neutralise the CO_2 evolved respectively are

A. $7g$, $2.86L$

B. $5g$, $1.86L$

C. $4g$, $0.86L$

D. none

Answer: A

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81. A mixture of $Na_2C_2O_4$ and $KHC_2O_4.H_2C_2O_4$ required equal volumes of 0.2 M $KMnO_4$ and 0.2 M NaOH separately for complete

titration the mole ratio of $Na_2C_2O_4$ and $KHC_2O_4.H_2C_2O_4$ in the mixture is

A. $\frac{2}{11}$

B. $\frac{11}{2}$

C. $\frac{5}{2}$

D. $\frac{7}{2}$

Answer: B

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82. The weight of MnO_2 and the volume of HCl of specific gravity 1.2 g mL^{-1} and 4% nature by weight, needed to produce 1.78 L of Cl_2 at STP. The reaction involved is:

$$MnO_2 + 4\text{HCl} \rightarrow MnCl_2 + 2H_2O + Cl_2$$

A. $0.48L$

B. $0.24L$

C. $0.12L$

D. $0.06L$

Answer: B

Watch Video Solution

83. How many moles of O_2 will be liberated by one mole of CrO_5 is the following reaction:

$$CrO_5 + H_2SO_4 \rightarrow Cr_2(SO_4)_3 + H_2O + O_2$$

A. $\frac{5}{2}$

B. $\frac{5}{4}$

C. $\frac{9}{2}$

D. none of these

Answer: D

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84. The purity of H_2O_2 in a given sample is $85\ \%$. Calculate the weight of impure sample of H_2O_2 which requires $10mL$ of $M/5KMnO_4$ solution in a titration in acidic medium

A. 2 g

B. 0.2 g

C. 0.17 g

D. 0.15 g

Answer: B

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85. 0.848 g aqueous solution of a mixture containing Na_2CO_3 NaOH, and an inert matter is titrated with $\frac{M}{2}$ HCl. The colour of phenolphthalein disappears when 20 " mL of " the acid has been added. Methyl orange is

then added and 8.0 mL more of the acid is requried to give a red colour to the solution. The percentage of Na_2CO_3 is

A. 25

B. 12.5

C. 75

D. 50

Answer: D

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Exercises Assertion Reasoning

1. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of (A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are incorrect.

Q. Assertion: 5.0 " mol of "ferrous oxalate are completely oxidised by 2.5 moles of acidic solution of $K_2Cr_2O_7$.

Reason(R): n-factor of ferrous oxalate against dichromate is 3.

Watch Video Solution

2. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of (A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are incorrect.

Q. Assertion (A): If x " mL of " 0.2 M H_2SO_4 solution requires 10 " mL of " 0.24 M KOH solution then x " mL of " 0.1 M H_2SO_3 would require 20 " mL of " 0.01 M acidified $K_2Cr_2O_7$

solution.

Reason (R): H_2SO_3 is dibasic acid.

Watch Video Solution

3. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of (A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are incorrect.

Q. Assertion (A): $MnO_4^{\ominus} + S_2O_3^{2-} \xrightarrow[pH=7]{} MnO_2 + HSO_4^{\ominus}$

Reason (R): The n factor for $MnO_4^{\ominus}$ and $S_2O_3^{2-}$ ions respectively are 3 and 8.

Watch Video Solution

4. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of (A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are incorrect.

Q. Assertion (A): In the titration of Na_2CO_3 with HCl using methyl orange indicator the volume required at the equivalence point is twice that of the acid requried using phenolphthalein indicator.

Reason (R): 2 " mol of "HCl are requried for complete neutralisation of one mole of Na_2CO_3.

Watch Video Solution

5. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of

(A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are incorrect.

Q. Assertion (A): H_3PO_2 is mono basic acid.

Reason (R): Two H-atoms are attached to pghosphorous (P).

Watch Video Solution

6. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of (A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are incorrect.

Q. Assertion (A): Equivalent mass of $KMnO_4$ is equal to one-fifth of its molecular mass when it acts as oxidising agent in mild basic medium.

Reason (R): Oxidation number of Mn in $KMnO_4$ is $+7$.

Watch Video Solution

7. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of (A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are incorrect.

Q. Assertion (A): IN the reaction $2S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I^{\ominus}$

Reason (R): During oxidation loss of electron takes place.

Watch Video Solution

8. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of (A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are incorrect.

Q. Assertion (A): In the titration of strong acid and strong base, phenolphthalein is used as suitable indocator.

Reason (R): IN the titration of strong acid and strong base, the equivalence points lies is the pH range of $(3.0 - 10.5)$ and phenolphthalein have pH range of $(8.0 - 9.8)$.

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9. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of (A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are incorrect.

Q. Assertion (A): Concentration of H_2O_2 is expressed in volume

Reason (R): Volume strength $=$ normality $\times 5.6$

Watch Video Solution

10. Assertion (A): Hardness of water is determined by titrating it with disodium salt of $EDTA$.

Reason (R) :The indicator used in the titration is Eriochrome Black$-T$ at $pH = 10$.

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11. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of (A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are incorrect.

Q. Assertion (A): if x " mL of " 0.1 M $KMnO_4$ solution requires 100 " mL of " 0.1 M CuS solution for complete neutralisation then x " mL of " same $KMnO_4$ solution would require 75 " mL of " 0.1 M Cu_2S solution.

Reason (R): n factor for Cus and Cu_2S respectively are 6 and 8.

Watch Video Solution

12. Assertion (A): Temporary hardness in water is due to the presence of chlorides of magnesium.

Reason (R) :Temporary hardness is removed by Clark's method.

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13. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of (A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are

incorrect.

Q. Assertion (A): The amount CO in a gas sample can be determined by using the reaction

$I_2O_5 + 5CO \rightarrow I_2 + 5CO_2$

IF gas sample liberates $127.\ gof I_2$. Then 70 g of CO were present in the sample.

Reason (R): CO gas is absorbed in ammonical CuCl solution.

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14. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of (A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are incorrect.

Q. Assertion (A): Estimation of reducing substance by the use of standard I_2 is called iodometry.

Reason (R): in the reaction

$I_2 + S_2O_3^{2-} \rightarrow S_4O_6^{2-} + 2I^{\ominus}$

The n factor of $S_2O_3^{2-}$ is one.

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15. (a). IF both (A) and (R) are correct and (R) is the correct explanation of (A).

(b). If both (A) and (R) are correct but (R) is not the correct explanation of (A).

(c). If (A) is correct, but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct. ltbr. (e) if both (A) and (R) are incorrect.

Q. Assertion (A): When gaseous hydrocarbon are completely burnt in eudiometer tube with excess of O_2 and after cooling there is a contraction in the volume of gases.

Reason (R): The volume of H_2O is not considered.

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Exercises Integer

1. N-factor for the following reaction is

$FeS_2 \rightarrow Fe_2O_3 + SO_2$

A. 8

B. 9

C. 10

D. 11

Answer: D

View Text Solution

2. In the following reaction

$As_2S_3 + NO_3^{\ominus} + H_2O \rightarrow AsO_4^{3-} + SO_4^{2-} + NO + H^{\oplus}$ The number of electrons involved in the oxidation reaction is

A. 22

B. 24

C. 26

D. 28

Answer: D

View Text Solution

3. n-factor of ferrous oxalate and ferric oxalate when they react with $K_2Cr_2O_7$ is acidic medium are

A. 2,6

B. 6,2

C. 3,6

D. 6,3

Answer: C

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4. n-factors for Cu_sS and CuS when they react with $KMnO_4$ in acidic medium are

A. 7,7

B. 6,6

C. 6,8

D. 8,6

Answer: D

View Text Solution

5. How many moles of H_2SO_4 are requried to produce 1 " mol of "H_2S when KI reacts with H_2SO_4 producing I_2 and H_2S?

A. 5

B. 4

C. 3

D. 2

Answer: A

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6. Commerical 11.2 volume H_2O_2 solution has a molarity of

A. 2M

B. 1 M

C. 3 M

D. 4 M

Answer: B

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7. 1 " mol of "$IO_3^{\ominus}$ ions is heated with excess of $I^{\ominus}$ ions in the presence of acidic conditions as per the following equation

$IO_3^{\ominus} + I^{\ominus} \rightarrow I_2$

How many moles of acidified bypo solution will be required to react completely with I_2 thus produced?

A. 1

B. 3

C. 5

D. 6

Answer: D

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8. A bottle of H_2O is labelled as 10 vol H_2O_2. 112 " mL of " this solution of H_2O_2 is titrated against 0.04 M acidified solution of $KMnO_4$ the volume of $KMnO_4$ in litre is

A. 1 L

B. 2 L

C. 3 L

D. 4 L

Answer: A

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9. 1 L $\frac{M}{10}Ba(MnO_4)_2$ in acidic medium can be oxidised completely with $\frac{1}{6}$ L of x M ferric oxalate. The volume of x is

A. 1 M

B. 2 M

C. 3 M

D. 4 M

Answer: A

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10. The oxidation state of oxygen of H_2O_2 in the final products when it reacts with $ClO_3^{\ominus}$ is

A. 0

B. 1

C. -1

D. -2

Answer: A

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11. What is the oxidation state of oxygen of H_2O_2 in the final products when it reacts with As_2O_3?

A. 0

B. 1

C. -1

D. -2

Answer: D

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12. Washing soda $(Na_2CO_3.10H_2O)$ is widely used in softening of hard waer. If 1 L of hard water requires 0.0286 g of washing soda, the hardness of $CaCO_3$ in ppm is

A. 10 ppm

B. 5 ppm

C. 8 ppm

D. 6 ppm

Answer: A

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13. Dissolved O_2 in water is determined by using a redox reaction

$$2Mn^{2+}(aq) + 4\overset{\ominus}{O}H(aq) + O_2(g) \rightarrow 2MnO_2(s) + 2H_2O(l)$$

How many equivalents of O_2 will be required to react with 1 " mol of " Mn^{2+}?

A. 1

B. 2

C. 3

D. 4

Answer: B

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14. The normality of 2 M H_3BO_3 is

A. 6

B. 4

C. 2

D. 1

Answer: C

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15. An acid solution of 0.2 " mol of "$KReO_4$ was reduced with Zn and then titrated with 1.6 " Eq of "acidic $KMnO_4$ solution for the reoxidation of the ehenium (Re) to the perrhenate ion $\left(ReO_4^{\ominus}\right)$. Assuming that rhenium was the only elements reduced, what is the oxidation state to which rhenium was reduced by Zn?

A. 1

B. 2

C. -1

D. -2

Answer: C

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16. A 200 mL solution of I_2 divided into two unequal parts. Part I reacts with pypo solution in acidic medium and required 8 " mL of " 2 M hypo solution for complete neutralisation. Part II was added with 300 " mL of " 0.1 M $NaOH$ solution residual base required $30\ \text{mL of}\ 0.1MH_2SO_4$ solution for complete neutralisation. Calculate the value of 20 times the initiall concentration I_2?

A. 1

B. 2

C. 3

D. 4

Answer: B

View Text Solution

Archives Multiple Correct

1. Reduction of the metal centre in aqueous permanganate ion involves

A. 3 electrons in neutral medium

B. 5 electrons in neutral medium

C. 3 electrons in alkaline medium

D. 5 electrons in alkaline medium

Answer: A::D

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Archives Single Correct

1. The volume strength of $1.5NH_2O_2$ solution is

A. 4.8

B. 8.4

C. 3

D. 8

Answer: B

Watch Video Solution

2. The number of moles of $KMnO_4$ that will be needed to react with $1mol$ of sulphite ion in acidic solution is

A. $\frac{2}{5}$

B. $\frac{3}{5}$

C. $\frac{4}{5}$

D. 1

Answer: A

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3. In the neutralization of $Na_2S_2O_3$ using $K_2Cr_2O_7$ by idometry, the equivalent weight of $K_2Cr_2O_7$ is

A. $\frac{Mw}{2}$

B. $\frac{Mw}{6}$

C. $\frac{Mw}{3}$

D. same as the molecular weight

Answer: B

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4. Consider a titration of potassium dichromate solution with acidified Mohr's salt solution using diphenylamine as indicator. The number of

moles of Mohr's salt required per mole of dichromate is:

A. 3

B. 4

C. 5

D. 6

Answer: D

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5. (a). If both (A) and (R) are correct and (R) is the appropriate explanation for (A).

(b). If both (A) and (R) are correct and (R) is the correct explanation of (A).

(c). If (A) is correct but (R) is incorrect.

(d). If (A) is incorrect, but (R) is correct.

(e). If both (A) and (R) are incorrect.

Q. Assertion (A): in the titration of Na_2CO_3 with HCl using methyl orange indicator, the volume required at the equivalence point is twice that of

the acid requried using phenolphthalein indicator.

Reason (R): Two moles of HCl is requried for the complete neutralisation of 1 " mol of "Na_2O_3

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Archives Integer

1. The volume (in mL) of $0.1MAgNO_3$ required for complete precipitation of chloride ions present in $30mL$ of $0.01M$ solution of $\left[Cr(H_2O)_5Cl\right]Cl_2$, as silver chloride is close to:

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2. Reaction of Br_2 with Na_2CO_3 in aqueous solution given sodium bromide and sodium bromate with evolution of CO_2 gas. The number of sodium bromide molecules involved in the balanced chemical equation is

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Archives Subjective

1. In the analysis of 0.1 of sample of feldspar, 0.118 g of mixture of NaCl and KCl is obtained which on treatment with $AgNO_3$ gives 0.2451 of AgCl. Calculate the precentage of Na_2O and K_2O in feldspar.

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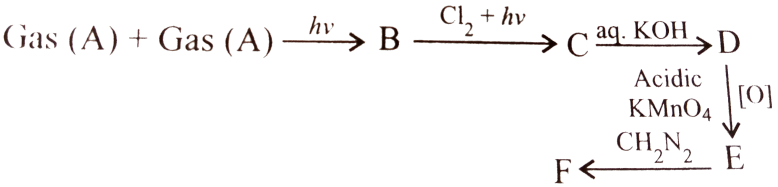
2. Five millilitires of a gas (A) containing only C and H was mixed with an excess of oxygen (30 ml) and the mixture was exploded by means of an electric spaek. After the explosion, the remaining volume of the mixed gasses was 25 ml. On adding a concentrated solution of KOH, the volume further diminished to 15 ml. The residual gas being pure oxyges.



The molecular formula of gas (A) is:

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3. (a). Take 1 L of a mixture of CO and CO_2 Pass this mixture through a tube containing red hot charcoal. The volume now becomes 1.6 L. The volumes are measured under the same conditions. Find the composition of the mixture by volume.

(b). A compound contains 28 percent of nitrogen 72 percent of a metal by weight. Three atoms of the metal combine with two atoms of N. find the atomic weight of the metal.

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4. Find out the equivalent weight of H_3PO_4in the reaction:

$Ca(OH)_2 + H_3PO_4 \rightarrow CaHPO_4 + 2H_2O$

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5. Hydroxylamine reduces Fe^{3+} accoeding to the following reaction:

$2NH_2OH + 4Fe^{3+} \rightarrow H_2O + 4Fe^{2+} + 4H^{\oplus} + N_2O$

Fe^{2+} produced is is estimated by titration with $KMnO_4$ solution A 10 mL sample of NH_2OH is diluted to 1000 mL. 50 " mL of " this diluted sample is boiled with excess of Fe (III) solution. The resulting solution required 12 " mL of " 0.02 M $KMnO_4$ for complete oxidation. Determine the strength of NH_2OH.

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6. An organic compound $\left(C_xH_{2y}O_y\right)$ was burnt with twice the amount of oxygen needed for complete combustion to CO_2 and H_2O. The hot gases, when cooled to $0^\circ C$ and $1atm$ pressure, measured $2.24L$. The water collected during cooling weighed $0.9g$. The vapour pressure of pure water at $20^\circ C$ is $17.5mmHg$ and is lowered by $0.104mm$ when $50g$ of the organic compound is dissolved in $1000g$ of water. Give the molecular formula of the organic compound.

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7. $4.08g$ of a mixture of BaO and an unknown carbonate MCO_3 was heated strongly. The residue weighed $3.64g$. This was dissolved in $100mL$ of $1NHCl$. The excess of acid required of $16mL$ of $2.5NNaOH$ for complete neutralisation. Identify the metal M.

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8. When 16.8 g of a white solid X was heated 4.4 g of an acid gas A which turned lime waer milky, was driven off together with 1.8 g of a gas B which condensed to a colourless liquid. The solid that remained Y dissolved in water to give an alkaline solution which with excess barium chloride solution gave a white precipitate Z. The precipitate effervesced with acid giving carbon dioxide. Identifu A,B and Y and write the quation for the thermal decomposition of X.

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9. 2.68×10^{-3} moles of solution containing anion A^{n+} require 1.61×10^{-3} moles of MnO_4^- for oxidation of A^{n+} to AO_3^- in acidic medium. What is the value of n?

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10. $5mL$ of $8NHNO_3$, $4.8mL$ of $5NHCl$ and a certain volume of $17MH_2SO_4$ are mixed together and made upto 2litre. $30mL$ of this acid mixture exactly neutralizes $42.9mL$ of Na_2CO_3 solution containing $1gNa_2CO_3$. $10H_2O\text{in}100mL$ of water. Calculate the amount of sulphate ions in g present in solution.

Watch Video Solution

11. What is the weight of sodium bromate and molarity of solution to prepare $85.5mL$ of $0.672N$ solution when half cell reaction are:

(i) $BrO_3^- \rightarrow 6H^+ + 6e^- \rightarrow Br^- + 3H_2O$

(ii) $2BrO_3^- + 12H^+ + 10e^- \rightarrow Br_2 + 6H_2O$

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12. A sample of hydrazine sulphate $(N_2H_6SO_4)$ was dissolved in $100mL$ water. $10mL$ of this solution was reacted with excess of $FeCl_3$ solution and warmed to complete the reaction. Ferrous ions formed were estimated and it required $20mL$ of $M/50KMnO_4$ solutions. Estimate the amount of hudrazine sulphate in one litre of solution.

Given $4Fe^{3+} + N_2H_4 \rightarrow N_2 + 4Fe^{2+} + 4H^+$

$MnO_4^- + 5Fe^{2+} + 8H^+ \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$

Watch Video Solution

13. An equal volume of reducing agent is titrated separately with $1MKMnO_4$ in acid, neutral and alkaline medium. The volumes of $KMnO_4$ required are $20mL, 33.3mL$ and $100mL$ in acid, neutral and alkaline medium respectively. Find out oxidation state of Mn in each reaction product. Give balance equation. Find the volume of

$1MK_2Cr_2O_7$ consumed if same volume of reductant is titrated in acid medium.

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14. n-butane is produced by the monobromination of ethane followed by Wurtz reaction. Calculate the volume of ethane at NTP to produce $55g$ n-butane if the bromination takes place with $90\,\%$ yield and the Wurtz reaction with $85\,\%$ yield.

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15. A mixture of $H_2C_2O_4$ and $NaHC_2O_4$ weighing $2.02g$ was dissolved in water and the solution made uptp one litre. $10mL$ of this solution required $3.0mL$ of $0.1NNaOH$ solution for complete neutralization. In another experiment $10mL$ of same solution in hot dilute H_2SO_4 medium required $4mL$ of $0.1NKMnO_4KMnO_4$ for compltete neutralization. Calculate the amount of $H_2C_2O_4$ and $NaHC_2O_4$ in mixture.

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16. A solid mixture $5g$ consists of lead nitrate and sodium nitrate was heated below $600^\circ C$ until weight of residue was constant. If the loss in weight is 28% find the amount of lead nitrate and sodium nitrate in mixture.

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17. A solution of $0.2g$ of a compound containing Cu^{2+} and $C_2O_4^{2-}$ ions on titration with $0.02MKMnO_4$ in presence of H_2SO_4 consumes $22.6mL$ oxidant. The resulting solution is neutralized by Na_2CO_3, acidified with dilute CH_3COOH and titrated with excess of KI. The liberated I_2 required $11.3mLof0.05MNa_2S_2O_3$ for complete reduction. Find out mole ratio of Cu^{2+} and $C_2O_4^{2+}$ in compound.

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18. A $1g$ sample of Fe_2O_3 solid of $55.2\,\%$ purity is dissolved in acid and reduced by heating the solution with zinc dust. The resultant solution is cooled and made upto $100mL$. An aliquot of $25mL$ of this solution requires $17mL$ of $0.0167M$ solution of an oxidant for titration. Calculate no.of electrons taken up by oxidant in the above titration.

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19. A $2.0g$ sample of a mixture containing sodium carbonate, sodium bicarbonate and sodium sulphate is gently heated till the evolution of CO_2 ceases. The volume of CO_2 at $750mmHg$ pressure and at $298K$ is measured to be $123.9mL$. A $1.5g$ of the same sample requires $150mL$ of $(M/10)HCl$ for complete neutralisation. Calculate the percentage composition of the components of the mixture.

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20. $1g$ sample of $AgNO_3$ is dissolved in $50mL$ of water, It is titrated with $50mL$ of KI solution. The Aglpercipitated is filtered off. Excess of KI filtrate is titrated with $M/10KIO_3$ in presence of $6MHCl$ till all I^- converted into ICI. It requires $50mL$ of $M/10KIO_3$ solution. $20mL$ of the same stock solution of KI requires $30mL$ of $M/10KIO_3$ under similar conditions. Calculate $\%$ of $AgNO_3$ in sample. The reaction is

$KIO_3 + 2KI + 6HCl \rightarrow 3ICl + 3KCl + 3H_2O$

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21. The composition of a sample of wustite is $Fe_{0.93}O_{1.00}$. What percentage of iron is present in the form of $Fe(III)$?

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22. A is a binary compound of a univalent metal. When 1.422 g of A reacts completely with 0.321 g of sulphur in an evacuated and sealed tube, 1.743

g of white crystalline solid B produced, which produces a hydrated double salt C with $Al_2(SO_4)_3$. Identfy A, B and C.

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23. A mixture of ethane (C_2H_6) and ethene (C_2H_4) occupies $40L$ at $1.00atm$ and at $400K$. The mixture reacts completely with $130g$ of O_2 to produce CO_2 and H_2O. Assuming ideal gas behaviour, calculate the mole fractions of C_2H_4 and C_2H_6 in the mixture.

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24. A $5.0mL$ of solution of H_2O_2 liberates $0.508g$ of iodine from acidified KI solution. Calculate the strength of H_2O_2 solution in terms of volume strength at STP.

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25. A 20 mL mixture of CO, CH_4, and Helium (He) gases is exploded by an electric discharge at room temperature with excess of oxygen. The volume contraction is found to be 13 mL. A further contraction of 14 mL occurs when the residual gas is treated wityh KOH solution. Find out the composition of the gaseous mixture in terms of volume percentage.

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26. A $3.0g$ sample containing Fe_3O_4, Fe_2O_3 and an inert impure substance is treated with excess of KI solution in presence of dilute H_2SO_4. The entire iron is converted to Fe^{2+} along with the liberation of iodine. The resulting solution is diluted to $100mL$. A $20mL$ of dilute solution requires $11.0mL$ of $0.5MNa_2S_2O_3$ solution to reduce the iodine present. A $50mL$ of the diluted solution, after complete extraction of iodine requires $12.80mL$ of $0.25MKMnO_4$ solution in dilute H_2SO_4 medium for the oxidation of Fe^{2+}. Calculate the percentage of Fe_2O_3 and Fe_3O_4 in the original sample.

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27. To a 25 mL H_2O_2 solution excess of an acidified solution of potassium iodide was added. The iodine liberated required 20 " mL of " 0.3 N sodium thiosulphate solution Calculate the volume strength of H_2O_2 solution.

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28. An aqueous solution containing 0.10 g KIO_3 (formula weight $= 214.0$) was treated with an excess of KI solution the solution was acidified with HCl. The liberated I_2 consumed 45.0 " mL of " thiosulphate solution to decolourise the blue starch-iodine complex. Calculate the molarity of the sodium thosulphate solution.

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29. Calculate the volume of 0.5 M H_2SO_4 required to dissolve 0.5 g of copper (II) carbonate $(CuCO_3)$.

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30. A plant virus is found to consist of uniform cylindrical particle of $150Å$ in diameter 5000 Å long. The specific volume of the virus is 0.75 mLg^{-1}. If the virus is considered to be a single particle, find its molar mass.

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31. Hydrogen peroxide solution $(20mL)$ reacts quantitatively with a solution of $KMnO_4(20mL)$ acidified with dilute of H_2SO_4. The same volume of the $KMnO_4$ solution is just decolourised by $10mL$ of $MnSO_4$ in neutral medium simultaneously forming a dark brown precipitate of hydrated MnO_2. The brown precipitate is dissolved in $10mL$ of $0.2M$ sodium oxalate under boiling condition in the presence of dilute H_2SO_4. Write the balanced equations involved in the reactions and calculate the molarity of H_2O_2.

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32. One gram of charcoal adsorbs 400 " mL of " 0.5 M acetic acid to form a mono layer and the molarity of acetic acid reduced to 0.49. Calculate the surface area of charcoal adsorbed by each molecule of acetic acid. The surface area of charcoal is $3.01 \times 10^2 m^2 g^{-1}$.

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33. Around $20\,\%$ surface sites have adsorbed N_2. On heating N_2 gas evolved form sites and were collected at 0.001 atm and 298 K in a container of volume $2.46 cm^3$ the density of surface sites is $6.023 \times 10^{14} cm^{-2}$ and surface area is $1000 cm^2$ find out the number of surface sites occupied per molecule of N_2.

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