CHEMISTRY

BOOKS - P BAHADUR CHEMISTRY (HINGLISH)

REDOX REACTIONS

Exercise 1 Elementary Numberical Problems

1. Select the nature or type of redox change in the following reactions:

(a) $2Cu^{+} \rightarrow Cu^{2+} + Cu^{0}$

(b) $Cl_2 \rightarrow ClO^{-} + Cl^{-}$

(c) $2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$

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

(e)

$10FeSO_4 + 2KMnO_4 + 8H_2SO_4 \rightarrow K_2SO_4 \rightarrow 2MnSO_4 + 5Fe_2(SO_4)_3$

(f)

$5H_2C_2O_4 + 2KMnO_4 + 3H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 10CO_2 + 8H_2$

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2. Identify the oxidised and reduced species in the following reactions:

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

(b) $MnO_{2(s)} + C_2H_2O_{4(aq.)} \xrightarrow{2H^+} Mn^{2+}_{(aq.)} + 2CO_{2(g)} + 2H_2O_{(l)}$

(c) $I_{2(aq.)} + 2S_2O^{2-}_{3(aq.)} \rightarrow 2I^-_{(aq.)} + S_4O^{2-}_6$

(d) $Cl_{2(g)} + 2Br^-_{(aq.)} \rightarrow 2Cl^-_{(aq.)} + Br_{2(aq.)}$

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3. Identify the substance acting as oxidant or reductant if any in the following:

(i) $AlCl_3 + 3K \rightarrow Al + 3KCl$

(ii) $SO_2 + 2H_2S \rightarrow 3S + H_2O$

(iii) $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$

(iv) $3I_2 + 6NaOH \rightarrow NaIO_3 + 5NaI + 3H_2O$

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4. Write the half reactions for the following redox reactions:

(a) $2fe^{3+}_{(aq.)} + 2I^{-}_{(aq.)} \rightarrow 2Fe^{2+}_{(aq.)} + I_{2(aq.)}$

(b) $Zn_{(s)} + 2H^{+}_{(aq.)} \rightarrow Zn^{2+}_{(aq.)} + H_{2(g)}$

(c) $Al_{(s)} + 3Ag^{3+}_{(aq.)} \rightarrow Al^{3+}_{(aq)} + 3Ag_{(s)}$

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5. Determine the ox.no. of underlined atom in each of the following:

(a) $K\underline{Cr}O_3Cl$, (b) $K_2\underline{Fe}O_4$,

(c) $Ba(H_2\underline{P}O_2)_2$ (d) $Rb_4Na\left[H\underline{V}_{10}O_{28}\right]$

(e) $Ba_2\underline{Xe}O_6$

(f) $Na_2\underline{S}_2$

(g) $K_2\underline{Mn}O_4$ (h) $K_2\underline{Cr}_2O_7$

(i) $\underline{Mn}O_4^-$

(j) $\underline{S}O_4^{2-}$

(k) $\underline{P}O_4^{3-}$

(I) $\underline{C}O_3^{2-}$

(m) $\underline{Cu}(NH_3)_4^{2+}$ (n) $\underline{Ni}(CO)_4$

(o) $\underline{C}s_2$ (p) $(NH_4)_6\underline{Mo}_7O_{24}$

(q) $[\underline{Co}F_4]^-$ (r) $\underline{Os}O_4$

(s) $Na_4\underline{Xe}O_6$ (t) $K\underline{Cr}O_3Cl$

(u) $\underline{F}_2H_2$

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6. Find the oxidation number of carbon in the following compounds: $CH_3OH, CH_2O, HCOOH, C_2H_2$.

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7. Point out the oxidation number of C in the following:

$CH_4, C_3H_8, C_2H_6, C_4H_{10}, CO, CO_2$ and HCO_3^-, CO_3^{2-}

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8. What are oxidation numbers of

(a) $Sin Na_2S_2$

(b) V in VO_2^+ (dioxovanadium V)

(c) H in $LiAlH_4$

(d) V in VO^{2+} (oxovanadium IV)

(e) V in $HV_6O_{17}^{3-}$

(f) P in P_4S_6

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9. Arrange the following in order of:

(a) Increasing oxidation no. of Mn:

$MnCl_2, MnO_2, Mn(OH)_3, KMnO_4$

(b) Decreasing oxidation no.of. I:

$I_2, HI, HIO_4, ICI, IF_3, IF_5$

(c) Increasing oxidation no. of I

$I_2, HI, HIO_4, ICl, IF_3, IF_5$

(d) Increasing oxidation no.of. N:

$N_2, NH_3, N_3H, NH_2NH_2, NH_2OH, KNO_2, KNO_3, N_2O$

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10. How many mole of electrons are involved balancing the following equations:

(a) $H_2S + NO_3^- \rightarrow S + NO$

(b) $Mn(OH)_2 + H_2O_2 \rightarrow MnO_2 + 2H_2O$

(c) $Cr_2O_7^{2-} + Fe^{2+} + C_2O_4^{2-} \rightarrow Cr^{3+} + Fe^{3+} + CO_2$

(acid medium)

(d) $Br_2 + OH^- \rightarrow BrO_3^- + Br^-$

(e) The compound P_4S_3 is oxidised by nitrate ions acid medium to give phosphoric acid, sulphate ions and nitric oxide (NO). Write the balanced half reactions and the overall reaction.

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11. Evaluate equivalent weight of reductant or oxidant given on left hand side of each reaction:

(a) $As_2O_3 + 5H_2O \rightarrow 2AsO_4^{3-} + 10H^+ + 4e$

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

(c) $Cr_2O_7^{2-} + 14H^+ + 6e \rightarrow 2Cr^{3+} + 7H_2O$

(d) $C_2O_4^{2-} \rightarrow 2CO_2 + 2e$

(e) $FeC_2O_4 \rightarrow Fe^{3+} + 2CO_2 + 3e$

(f) $2CuSO_4 + 2e \rightarrow Cu_2^{1+} + SO_4^{2-}$

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12. How many mole of $FeSO_4, H_2C_2O_4$ and FeC_2O_4 are oxidised separately by one mole of $KMnO_4$ in acid medium?

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13. Reaction $2Br^-_{(aq.)} + Cl_{2(aq.)} \rightarrow 2Cl^-_{(aq.)} + Br_{2(aq.)}$, is used for commercial preparation of bromine from its salts. Suppose we have

$50mL$ of a $0.060M$ solution of $NaBr$. What volume of a $0.050M$ solution of Cl_2 is needed to react completely with the Br ?

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14. What mass of $Na_2S_2O_3.5H_2O$ is needed to make $500cm^3$ of $0.200N$ solution for the reaction?

$2S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I^-$

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15. How many equivalents are there per mole of H_2S in its oxidation to SO_2?

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16. $12.53mL$ of $0.0509MSeO_2$ reacted with $25.52mL0.1MCrSO_4$ solution. In the raeaction Cr^{2+} was oxidised to Cr^{3+}. To what oxidation

state selenium was converted in the reaction? Write the redox change for SeO_2.

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17. In a reaction, $Cr_2O_7^{2-}$ is reduced to Cr^{3+}. What is concentration of $0.1M K_2Cr_2O_7$ in equivalent per litre?

$Cr_2O_7^{2-} + 14H^+ + 6e \rightarrow 2Cr^{3+} + 7H_2O$

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18. What is molarity and normality of a MnO_4^- solution if $32.00mL$ of the solution is required to titrate $40.00mL$ of $0.400N Fe^{2+}$?

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

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19. $Mn^{2+}_{(aq.)}$ can be determined by titration with $MnO^{-}_{4(aq.)}$

$3Mn^{2+} + 2MnO_4^- \rightarrow 6MnO_2 + 2H_2O$

A $25.00mL$ sample of $Mn^{2+}_{(aq.)}$ requires $34.77mL$ of $0.05876MKMnO_{4(aq.)}$ for its titration. What is the molarity of the $Mn^{2+}_{(aq.)}$?

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20. $40mL$ of an acidified solution of $0.40M$ iron (II) is completely oxidised by $32mLKMnO_3$ solution, What is molarity of $KMnO_4$ solution?

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21. A $1.100g$ sample of copper ore is dissolved and the $Cu^{2+}_{(aq.)}$ is treated with excess KI. The liberated I_2 requires $12.12mL$ of $0.10MNa_2S_2O_3$ solution for titration. What is $\%$ copper by mass in the ore?

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22. What mass of $K_2Cr_2O_7$ is required to produce 5.0 litre CO_2 at $75^\circ C$ and $1.07atm$ Pressure on treating with excess of $H_2C_2O_4$ in acidic medium?

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23. What mass of N_2H_4 can be oxidised to N_2 by $24.0gK_2CrO_4$, which is reduced to $Cr(OH)_4^-$?

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

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25. Calculate the mass of oxalic acid $(H_2C_2O_4)$ which can be oxidised to CO_2 by $100.0mL$ of MnO_4^- solution, $10mL$ of which is capable of oxidising $50.0mL$ of $1.0NI^-$ to I_2?

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26. A $KMnO_4$ solution can be standarised by titration against $As_2O_{3(s)}$. A $0.1156g$ sample of As_2O_3 requires $27.06mL$ of the $KMnO_{4(aq.)}$ for its titration. What is the molarity of the $KMnO_{4(aq.)}$ [As $= 75$]?

$5As_2O_3 + 4MnO_4^- + 9H_2O + 12H^+ \rightarrow 10H_2AsO_4 + 4Mn^{2+}$

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27. A particular acid-rain water has SO_3^{2-}. If a $25.00mL$ sample of this water requires $34.08mL$ of $0.01964MKMnO_4$ for its titration, what is the molarity of SO_3^{2-} in acid-rain?

$2MnO_4^- + 5SO_3^{2-} + 6H^+ \rightarrow 5SO_4^2 + 2Mn^{2+} + 3H_2O$

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28. A solution containing $1.984g$ of crystalline $NA_2SO_2O_3.xH_2O$ in water required $40ml$ of $N/5$ Iodine solution for complete reaction .Calculate the value of x

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29. 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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30. A 0.56 g sample of limestones is dissolved in acid and the calcium is precipitated as calcium oxalate .The precipitate as calcium oxalate the prepcipate is filtered washed with water and dissolved in dil H_2SO_4 The

solution required $40ml$ of $0.25NKmnO_4$ solutions for titration .Calculate percentage of $0.25N\ KMnO_4$ solution for titration .Calculate of $0.25NKMnO_4$ solution for titration ,Calculate percentage of CaO in limestone sample.

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31. How many mL. of aqueous solution of $KMnO_4$ containing $158\frac{g}{L}$ must be used to complete the conversation of $75.0g$ of KI to iodine by the reaction

$KMnO_4 + KI + H_2SO_4 \rightarrow K_2SO_4 + MnSO_4 + I_2 + 6H_2O$

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32. What is the maximum weight of Cl_2 obtained by the action of $1g\ HCl$ on $1gMnO_2$?

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33. $25ml$ of $0.017H_2SO_4$ in strongly acidic medium required $16.9mL$ of $0.01MKMnO_4$ and in neutral medium required $28.6mL$ of $0.01MKMnO_4$ for complete conversion fo SO_3^{2-} to SO_4^{2-} .Assign the oxidation no of Mn in the product formed in each case.

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Exercise 2 Previous Year Numerical Problems

1. Indicate the oxidation number of underlined, $Ba(H_2\underline{P}O_2)_2$

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2. Balance the following equations:

(i) $Cr_2O_7^{2-} + I^- + H^+ \rightarrow Cr^{3+} + I_2 + H_2O$

(ii) $Ag^+ + AsH_3 \rightarrow H_3AsO_3 + H^+ + ...$

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3. Arrange the following in order of:

(a) Increasing oxidation no:

$MnCl_2, MnO_2, Mn(OH)_3, KMnO_4$

(b) Decreasing oxidation no:

HXO_4, HXO_3, HXO_2, HXO

(c) Increasing oxidation no.: I_2, HI, HIO_4, ICI

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4. 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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5. 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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6. Dichromate ion in acid solution oxidizes stannous ion as:

$3Sn^{2+} + 14H^{+} + Cr_2O_7^{2-} \rightarrow 3Sn^{+} + 2Cr^{3+} + 7H_2O$

(a) If $SnCl_2$ is the source of Sn^{2+}, how many g of $SnCl_2$ would be contained in 2litre of $0.1N$ solution?

(b) If $K_2Cr_2O_7$ is the source of $Cr_2O_7^{2-}$, what is the normality of solution containing $4.9gK_2Cr_2O_7$ in 0.1litre of solution?

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7. 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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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. In an ore, the only oxidizable material is Sn^{2+}. This ore is titrated with a dichromate solution containing $2.5g$ of $K_2Cr_2O_7$ in 0.5litre. A $0.40g$ sample of the ore required $10.0cm^3$ of titrant to reach equivalence point. Calculate the percentage of tin in ore.

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10. $20mL$ 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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11. $25mL$ of H_2O_2 solution were added to excess of acidified solution of KI. The iodine so liberated required $20mL$ of $0.1NNa_2S_2O_3$ for titration Calculate the strength of H_2O_2 in terms of normalility, percentage and volumes.

(b) To a $25mLH_2O_2$ solution, excess of acidified solution of KI was added. The iodine liberated required $20mL$ of $0.3N$ sodium thiosulphate solution. Calculate the volume strength of H_2O_2 solution.

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12. 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 10 mL of 0.2 M 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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13. $0.56g$ of lime stone was treated with oxalic acid to give CaC_2O_4. The precipitate decolorized $45ml$ of $0.2NKMnO_4$ in acid medium. Calculate $\%$ of CaO in lime stone.

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14. $5.7g$ of bleaching powder was suspended in $500mL$ of water. $25mL$ of this suspension on treatment with KI and HCl liberated iodine which reacted with $24.35mL of N/10 Na_2S_2O_3$. Calculate $\%$ of available Cl_2 in bleaching powder.

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15. 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 $11.3mL\text{of}0.05MNa_2S_2O_3$ for complete reduction. Find out mole ratio of Cu^{2+} and $C_2O_4^{2+}$ in compound.

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16. $1g$ sample of $AgNO_3$ is dissolved in $50mL$ of water, It is titrated with $50mL$ of KI solution. The $Agl\text{percipitated}$ 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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17. 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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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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19. A sample of $MnSO_4.4H_2O$ is strongly heated in air. The residue (Mn_3O_4) left was dissolved in $100mL$ of $0.1NFeSO_{94})$ containing dil.

H_2SO_4. This solution was completely reacted with $50mL$ of $KMnO_4$ solution. $25mL$ of this $KMnO_4$ solution was completely reduced by $30mL$ of $0.1NFeSO_4$ solution. Calculate the amount of $MnSO_4.4H_2O$ in sample.

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20. 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 $4Fe^{3+} + N_2H_4 \rightarrow N_2 + 4Fe^{2+} + 4H^+$

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

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21. 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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22. 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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23. 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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24. 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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25. $0.804g$ 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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26. $0.5g$ 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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27. 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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28. A sample weighing $2.198g$ containing a mixture of AO and A_2O_3 takes $0.015\text{mole of}K_2Cr_2O_7$ to oxidise the sample completely to form AO_4^- and Cr^{3+}. If 0.0187 mole ofAO_4^- is formed, what is $at.\ wt.$ of A?

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29. 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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30. $12.\ g$ 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 $As = 57$)

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Exercise 3 A Objective Problems

1. The oxidation states of the most electronegative elements in the products of the reaction between BaO_2 and H_2SO_4 are

A. $0$and -1

B. -1 and -2

C. $-2$and 0

D. $-2$and -1

Answer: B

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2. When SO_2 is passed through an acidified $K_2Kr_2O_7$ solution, the oxidation state of sulphur changes from

A. $+4$ to 0

B. $+4$ to $+2$

C. $+4$ to $+6$

D. $+6$ to $+4$

Answer: C

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3. Hydrogen gas will not reduce:

A. Heated cupric oxide

B. Heated ferric oxide

C. Heated stannic oxide

D. Heated aluminium oxide

Answer: D

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4. The oxidation state of Cr in CrO_5 is:

A. $+10$

B. $+6$

C. $+3$

D. `+3.5

Answer: B

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5. Tailing of mercury can be removed by:

A. H_2O_2

B. O_3

C. O_2

D. None of these

Answer: A

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6. The oxidation number and covalency of sulphur in the sulphur molecule (S_8) are respectively:

A. 0 and 2

B. $+6$ and 8

C. 0 and 8

D. $+6$ and 2

Answer: A

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7. How many mole of electrons are involved in the reduction of one mole of MnO_4^- ion in alkaline medium to MnO_3^-

A. 2

B. 1

C. 3

D. 4

Answer: A

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8. For the redox reaction

$$MnO_4^{\ominus} + C_2O_4^{2-} + H^{\oplus} \rightarrow Mn^{2+} + CO_2 + H_2O$$

the correct coefficients of the reactions for the balanced reaction are

A. $MnO_4^- = 2, C_2O_4^{2-} = 5, H^+ = 16$

B. $MnO_4^- = 16, C_2O_4^{2-} = 5, H^+ = 2$

C. $MnO_4^- = 5, C_2O_4^{2-} = 16, H^+ = 2$

D. $MnO_4^- = 2, C_2O_4^{2-} = 16, H^+ = 5$

Answer: A

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9. It is found that V forms a double salt isomorphous with Mohr's salt. The oxidation number of V in this compound is:

A. $+3$

B. $+2$

C. $+4$

D. -4

Answer: B

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10. The oxidation number of sulphur in $H_2S_2O_8$ is:

A. $+2$

B. $+6$

C. $+7$

D. $+14$

Answer: B

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11. 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

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12. Number of electron involved in the reduction of $Cr_2O_7^{2-}$ ion in acidic solution to Cr^{3+} is:

A. 3

B. 4

C. 2

D. 6

Answer: D

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13. Oxidation state of nitrogen is incorrectly given for:

A.

Compound	Oxidation state
$[Co(NH_3)_5Cl]Cl_2$	-3

B.

Compound	Oxidation state
NH_2OH	-1

C.

Compound	Oxidation state
$(N_2H_5)_2SO_4$	$+2$

D.

Compound	Oxidation state
Mg_3N_2	-3

Answer: C

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14. The number of electrons lost in the following change is

$Fe + H_2O \rightarrow Fe_3O_4 + H_2$

A. 2

B. 4

C. 6

D. 8

Answer: D

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15. The oxidation number of C in HNC is

A. $+2$

B. -3

C. $+3$

D. zero

Answer: A

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16. Oxidation number of Cl in $NOClO_4$ is:

A. $+7$

B. -7

C. $+5$

D. -5

Answer: A

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17. Oxidation number of S in $\left[(CH_3)_2SO\right]$ is:

A. Zero

B. $+1$

C. $+2$

D. $+3$

Answer: A

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18. The equivalent weight of salt

$KHC_2O_4.\ H_2C_2O_4.4H_2O$ when used as reducing agent : $-$

A. $\text{Mol.wt.}\ /1$

B. $\text{Mol.wt.}\ /2$

C. $\text{Mol.wt.}\ /3$

D. $\text{Mol.wt.}\ /4$

Answer: D

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19. The oxidation number of Cl in $CaOCl_2$ is

A. -1 and $+1$

B. $+2$

C. -2

D. None of these

Answer: A

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20. Oxidation number of carbon in carbon sub-oxide is:

A. $+2/3$

B. $+4/3$

C. $+4$

D. $-4/3$

Answer: B

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21. The colour of $K_2Cr_2O_7$ changes from red-orange to lemon-yellow on treatment with $KOH_{(aq.)}$, because of:

A. Reduction of $Cr(VI)$ to $Cr(III)$

B. Formation of chromium hydroxide

C. Conversion of dichromate into chromate ion

D. Oxidation of potassium hydroxide to potassium peroxide

Answer: C

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22. $50mL$ of $0.1M$ solution of a salt reacted with $25mL$ of $0.1M$ solution of sodium sulphite. The half reaction for the oxidation of sulphate ion is:

$SO^{2-}_{3(aq.)} + H_2O_{(l)} \rightarrow SO^{2-}_{4(aq.)} + 2H_{+(aq.)} + 2e$

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

A. Zero

B. 1

C. 2

D. 4

Answer: C

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23. 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 mole of N_2

B. 0.5 mole of N_2O

C. 1 mole of NO_2

D. 1 mole of NH_3

Answer: B

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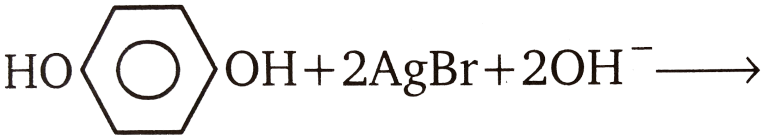
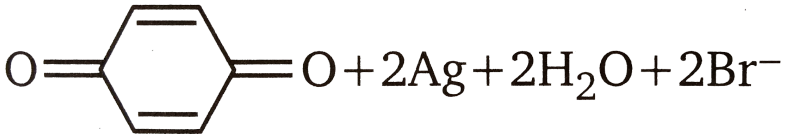
24. During developing of an exposed camera, film one step involves in the following reaction,



(Hydroquinol)



,brgt Which of the following best describes the role of hydroquinol?

A. It acts as an acid

B. It acts as reducing agent

C. It acts as oxidant

D. It acats as a base

Answer: B

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25. The ratio of equivalent weights of C_2H_5OH in the following reactions is:

(i) $C_2H_5OH \rightarrow CH_3CHO$

(ii) $C_2H_5OH \rightarrow C_2H_5ONa$

A. $1:4$

B. $1:1$

C. $1:2$

D. $1:3$

Answer: C

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26. An element A in a compound ABD has oxidation number A^{n-}. It is oxidised by $Cr_2O_7^{2-}$ in acid medium. In the experiment 1.68×10^{-3} moles of $K_2Cr_2O_7$ were used for 3.26×10^{-3} moles of ABD. The new oxidation number of A after oxidation is:

A. 3

B. $3 - n$

C. $n - 3$

D. $+n$

Answer: B

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27. $N_2 + 3H_2 \rightarrow 2NH_3$

Molecular weight of NH_3 and N_2 are x_1 and x_2, respectively. Their equivalent weights are y_1 and y_2, respectively. Then $(y_1 - y_2)$

A. $\left(\frac{2X_1 - X_2}{6}\right)$

B. $(X_1 - X_2)$

C. $(3X_1 - X_2)$

D. $(X_1 - 3X_2)$

Answer: A

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28. Equivalent weight of FeC_2O_4 during its reaction with $KMnO_4$ is:

A. $M/3$

B. $M/1$

C. $M/2$

D. $M/4$

Answer: A

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29. The no.of electrons involved in the change,

$Fe_3O_4 \rightarrow Fe_2O_3$:

A. 2

B. 8

C. 6

D. 4

Answer: A

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30. How many gram of I_2 are present in a solution which requires $40mL$ of $0.11NNa_2S_2O_3$ to react with it, $S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I$

A. $12.7g$

B. $0.558g$

C. $25.4g$

D. $11.4g$

Answer: B

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31. What weight of $FeSO_4$ (mol.wt. $= 152$) will be oxidised by $200mL$ of normal $KMnO_4$ solution in acid solution?

A. $30.4g$

B. $60.8g$

C. $121.6g$

D. $15.8g$

Answer: A

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32. $25mL$ of $0.50MH_2O_2$ solution is added to $50mL$ of $0.20MKMnO_4$ is acid solution. Which of the following statements is true?

A. 0.010 mole of oxygen is liberated

B. 0.005 mole of $KMnO_4$ are left

C. $0.030g$ atom of oxygen is liberated

D. 0.0025 mole of H_2O_2 does not react with $KMnO_4$

Answer: B

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33. What volume of O_2 measured at standard condition will be formed by the action of $100mL$ of $0.5NKMnO_4$ on hydrogen peroxide in an acid solution?

The skeleton equation for the reaction is,

$$KMnO_4 + H_2SO_4 + H_2O_2 \rightarrow KHSO_4 + MnSO_4 + H_2O + O_2$$

A. 0.12litre

B. 0.28litre

C. 0.56litre

D. 1.12litre

Answer: B

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34. The number of Fe^{2+} ion oxidised by one mole of MnO_4^- ions is:

A. $1/5$

B. $2/3$

C. 5

D. $3/2$

Answer: C

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35. What mass of HNO_3 is needed to convert 5g of the iodine into iodic acid according to the reaction

$I_2 + HNO_3 \rightarrow HIO_3 + NO_2 + H_2O$

A. $12.4g$

B. $24.8g$

C. $0.248g$

D. $49.6g$

Answer: A

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36. Number of K^+ ions present in one litre of $M/5KMnO_4$ solution are:

A. 10×10^{24}

B. 1.024×10^{23}

C. 6.02×10^{23}

D. 3.01×10^{24}

Answer: B

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37. When the ion $Cr_2O_7^{2-}$ acts as an oxidant in acidic aqueous solution the ion Cr^{3+} is formed. How many mole of Sn^{2+} would be oxidised to Sn^{4+} by one mole $Cr_2O_7^{2-}$ ion:

A. $2/3$

B. $3/2$

C. 2

D. 3

Answer: D

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38. What volume of 3 molar HNO_3 is needed to oxidise $8g$ of Fe^{3+}, HNO_3 gets converted to NO ?

A. $8mL$

B. $16mL$

C. $32mL$

D. $64mL$

Answer: B

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39. Given that $500mL$ of $0.01MNa_2S_2O_3$ solution and 5×10^{-4} mole of Cl_2 react according to equation,

$Cl_{2(g)} + S_2O_3^{2-} \rightarrow SO_4^{2-} + Cl^- + S$

Answer the following:

(i) The balanced molecular equation is:

A. $Cl_2 + H_2O + Na_2S_2O_3 \rightarrow Na_2SO_4 + S + 2HCl$

B. $Cl_2 + Na_2S_2O_3 \rightarrow 2NaCl + Na_2SO_4$

C. $Cl_2 + S_2O_3^{2-} \rightarrow SO_4^{2-} + S + Cl^-$

D. None of these

Answer: A

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40. Given that $500mL$ of $0.01MNa_2S_2O_3$ solution and 5×10^{-4} mole of Cl_2 react according to equation,

$Cl_{2(g)} + S_2O_3^{2-} \rightarrow SO_4^{2-} + Cl^- + S$

Answer the following:

(ii) How many moles of $S_2O_3^{2-}$ are in the above sample?

A. 0.00050

B. 0.0025

C. 0.01

D. 0.02

Answer: A

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41. Given that $500mL$ of $0.01MNa_2S_2O_3$ solution and 5×10^{-4} mole of Cl_2 react according to equation,

$Cl_{2(g)} + S_2O_3^{2-} \rightarrow SO_4^{2-} + Cl^- + S$

Answer the following:

(iii) How many equivalents of oxidising agents are in this sample for the above reaction?

A. 0.001

B. 0.080

C. 0.020

D. 0.010

Answer: A

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42. Given that $500mL$ of $0.01MNa_2S_2O_3$ solution and 5×10^{-4} mole of Cl_2 react according to equation,

$$Cl_{2(g)} + S_2O_3^{2-} \rightarrow SO_4^{2-} + Cl^- + S$$

Answer the following:

What is the molarity of Na_2SO_4 in this solution?

A. $0.080M$

B. $0.040M$

C. $0.020M$

D. $0.010M$

Answer: D

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43. $4I^- + Hg^{2+} \rightarrow HgI_4^{2-}$, 1 mole each of Hg^{2+} and I^- will form..... Mole HgI_4^{2-}:

A. 1mole

B. 0.5mole

C. 0.25mole

D. 2mole

Answer: C

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44. 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

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45. $0.3g$ of an oxalate salts was dissolved in $100mL$ solution. The solution required $90mL$ of $N/20KMnO_4$ for complete oxidation. The $\%$ of oxalate ion in salt is:

A. $33\ \%$

B. $66\ \%$

C. $70\ \%$

D. $40\ \%$

Answer: B

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46. A $0.518g$ sample of limestone is dissolved in HCl and then the calcium is precipitated as CaC_2O_4. After filtering and washing the precipitate, it requires 40.0 filtering and washing the precipitate, it requires $40.0mL$ of $0.250NKMnO_4$, solution acidified with H_2SO_4 to titrate it as. The percentage fo CaO in the sample is:

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

A. $54.0\ \%$

B. $27.1\ \%$

C. $42\ \%$

D. $84\ \%$

Answer: A

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47. The number of mole of oxalate ions oxidised by one mole of MnO_4^- ion is:

A. $1/5$

B. $2/5$

C. $5/2$

D. 5

Answer: C

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48. The number of moles of $KMnO_4$ that will be needed to react with $1mol$ of sulphite ion in acidic solution is

A. $2/5$

B. $3/5$

C. $4/5$

D. 1

Answer: A

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

A. $3/5$

B. $2/5$

C. $4/5$

D. 1

Answer: A

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50. When BrO_3^- ion reacts with Br^- iron in acid solution Br_2 is liberated. The equivalent weight of $KBrO_3$ in this reaction is:

A. $M/8$

B. $M/3$

C. $M/5$

D. $M/6$

Answer: C

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51. $2H_2O_2(l) \rightarrow 2H_2o(l) + O_2(g)$

$100mL$ of X molar H_2O_2 gives $3L$ of O_2 gas under the condition when 1 mole occupies $24L$. The value of X is

A. 2.5

B. 1

C. 0.5

D. 0.25

Answer: A

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52. $8g$ of sulphur are burnt to form SO_2, which is oxidised by Cl_2 water. The solution is treated with $BaCl_2$ solution. The amount of $BaSO_4$ precipitated is:

A. 1mole

B. 0.5mole

C. 0.24mole

D. 0.25mole

Answer: D

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53. In $CH_2 = CCl_2$, the two carbon atoms have oxidation number respectively:

A. $-2, +2$

B. $-2, -2$

C. $+2, +2$

D. $+2, -2$

Answer: A

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54. On combustion of CH_4 to CO_2 and H_2, the oxidation number of carbon changes by:

A. 8

B. Zero

C. 4

D. 3

Answer: A

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55. Which does not possess oxidation number of S equal to $+6$?

A. Caro's acid

B. Marshall's acid

C. Oleum

D. Hypo

Answer: D

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56. The incorrect order of decreasing oxidation number of S in compound is:

A. $H_2S_2O_7 > Na_2S_4O_6 > Na_2S_2O_3 > S_8$

B. $H_2SO_5 > H_2SO_3 > SCl_2 > H_2S$

C. $SO_3 > SO_2 > H_2S > S_8$

D. $H_2SO_4 > SO_2 > H_2S > H_2S_2O_8$

Answer: C, D

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57. The oxidation number of C in $NaOCN$ and $NaCNS$ are repspectively:

A. $-2, \ -2$

B. $+2, \ -2$

C. $-3, \ -2$

D. $+4, \ +4$

Answer: D

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58. Maximum oxdation number of under lined atom is shown in:

A. $\underline{\text{Osmium}}\text{tetroxide}$

B. $\underline{\text{Ruthenium}}\text{tetroxide}$

C. $\underline{\text{Perxenate}}$ ion

D. All of the above

Answer: D

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59. The number of electrons involved in the reduction of nitrate $\left(NO_3^{\ominus}\right)$ to hydrazine (N_2H_4) is

A. 8

B. 7

C. 5

D. 3

Answer: B

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60. Which of the following ion is spectator ion in the reaction given below:

$$Zn + 2H^+ + 2Cl^- \rightarrow Zn^{2+} + 2Cl^- + H_2$$

A. Zn^{2+}

B. H^+

C. Cl^-

D. None of these

Answer: C

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61. Which reaction does not represent auto redox or disproptionation?

A. $Cl_2 + OH^- \rightarrow Cl^- + ClO_3^- + H_2O$

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

C. $2Cu^+ \rightarrow Cu^{2+} + Cu$

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

Answer: D

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62. The average oxidation number of I in KI_3, Fe in Fe_3O_4 are respectively:

A. $-1/3,\ +8/3$

B. $-1,\ +8$

C. $0,\ +3$

D. $0,\ +2$

Answer: A

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63. The correct name for NO_2 using stock notation is :

A. Nitrogen dioxide

B. Nitrogen (iv) oxide

C. Nitrogen per oxide

D. All of these

Answer: B

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64. The values of X, Y and Zs in the reaction are repectively:

$$XMnO_4^- + YH_2SO_4 \rightarrow ZMn^{2+} + 5H_2O + 9O_2 + Ze$$

A. $2, 5, 6$

B. $5, 2, 9$

C. $3, 5, 5$

D. 2,6,6`

Answer: A

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65. In which of the following metal atom has negative oxidation satate?

$$\underset{I}{CuH}, \quad \underset{II}{[Fe(CO)]^2}, \quad \underset{III}{Na - Hg}$$

A. I,II and III

B. II

C. I and III

D. II and III

Answer: B

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66. The value of x in the partial redox equation

$MnO_4^- + 8H^+ + xe \Leftrightarrow Mn^{2+} + 4H_2O$ is

A. 5

B. 10

C. 2

D. 3

Answer: A

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

A. 15.05

B. 84.95

C. 10.2

D. 89.8

Answer: A

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68. In which triplet each species can act as oxidant and reductant?

A. $H_2O_2, HNO_2, HClO_4$

B. KNO_2, SO_2, H_2O_2

C. HNO_3, SO_2, H_2SO_4

D. $KMnO_4, SO_3, O_3$

Answer: B

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69. Four Cl_2 molecules undergo a loss and gain of 6mole of electrons to form two oxidation states of Cl in a auto redox change. What are the $+ve$ and $-ve$ oxidation state of Cl in the change?

A. Cl^{5+}, Cl^0

B. Cl^{7+}, Cl^{1-}

C. Cl^{3+}, Cl^0

D. Cl^{3+}, Cl^{1-}

Answer: D

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70. Which species are oxidised and reduced in the reaction?

$$FeC_2O_4 + KMnO_4 \rightarrow Fe^{2+} + CO_2 + Mn^{2+}$$

A. Oxidised: Fe, CReduced: Mn

B. Oxidised: Fe Reduced: Mn

C. Reduced: Fe, Mn Oxidised: C

D. Reduced: C Oxidised: Mn, Fe

Answer: A

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71. The number of moles of $KMnO_4$ reduced by $1\text{mol of}KI$ in alkaline medium is

A. $1/5$

B. $1/2$

C. $1/4$

D. $1/5$

Answer: D

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72. 3 mole of $FeSO_4$ are oxidised by a mole of $KMnO_4$ in acidic medium whereas 3 moles of FeC_2O_4 are oxidised by b mole of $KMnO_4$ in acidic medium, the ratio of a and b is:

A. $1/3$

B. $1/2$

C. $1/4$

D. $1/5$

Answer: A

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73. Which of the following is not disproportionation (or auto redox) reaction?

A. $2CHO.COOH + OH^- \rightarrow H_2C_2O_4 + HOCH_2.COOH$

B. $Cl_2 + 2OH^- \rightarrow Cl^{-1} + ClO^- + H_2O$

C. $2C_6H_5CHO \xrightarrow{Al(OC_2H_5)_3} C_6H_5COOCH_2C_6H_5$

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

Answer: D

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74. Which of the following is not intramolecular redox raction?

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

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

C. $2Mn_2O_7 \rightarrow 4MnO_2 + 3O_2$

D. $2ClO_2 \rightarrow 5H_2O_2 \xrightarrow{2OH^-} 2Cl^- + 5O_2 + 6H_2$

Answer: D

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75. Which of the following is intermolecular redox change?

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

B. $NH_4NO_2 \rightarrow N_2 + 2H_2O$

C. $2H_2O_2 \rightarrow 3O_2$

D. $2O_3 \rightarrow 3O_2$

Answer: A

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76. The oxides which cannot act as reductant:

(I) CO_2 (II) SO_3 (III) P_4O_{10} (IV) NO_2

A. (I),(II),(III)

B. (II),(III),(IV)

C. (I),(II),(IV)

D. (III),(IV)

Answer: A

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77. Equivalent weight of $(NH_4)_2Cr_2O_7$ in the changes is:

$(NH)_4Cr_2O_7 \rightarrow N_2 + Cr_2O_3 + 4H_2O$

A. $M/6$

B. $M/8$

C. $M/2$

D. $M/3$

Answer: A

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78. Which one is not observed in the reaction?

$KO_2 + H_2O + CO_2 \rightarrow KHCO_3 + O_2$

A. A hydrolysis change

B. A disproportionation

C. Acid-base reaction

D. Non-redox change

Answer: D

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79. The $\left[CrO_4^{2-}\right]$ ions are equilibrium for the reaction,

$Cr_2O_7^{2-} + H_2O \leftrightarrow 2CrO_4^{2-} + 2H^+$, at $pH = 4$ is:

A. $10^4\left[Cr_2O_7^{2-}.K_c\right]^{1/2}$

B. $10^{-8}\left[Cr_2O_7^{2-}\right].K_c$

C. $10^{-4}\left[Cr_2O_7^{2-}\right]^{1/2}$

D. $10^{-4}\left[Cr_2O_7^{2-}\right].K_c$

Answer: A

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80. 1 litre solution of unknown molarity is titrated by taking its $50mL$ solution against KI solution is strong acidic medium of excess HCl. The equivalence point was detected when $10mL$ of $0.1MKI$ was consumed The molarity of KIO_3 solution is:

A. $4 \times 10^{-4}M$

B. $2 \times 10^{-2}M$

C. $4 \times 10^{-3}M$

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

Answer: C

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81. What happen when a solution of potassium chromate is treated with an excess of dil. Nitic acid?

A. $Cr_2O_7^{2-}$ and H_2O are formed

B. $Cr_2O_4^{2-}$ is reduced to 0 state of Cr

C. CrO_4^{2-} is reduced to $+3$ state of Cr

D. Cr^{3+} and $Cr_2O_7^{2-}$ are formed

Answer: A

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Exercise 3 B Objective Problems

1. Which statements (s) about oxidation number is (are) correct?

A. The oxidation numbers is the number of electrons lost $(+ve)$ or gained $(-ve)$ by an atom during the formation of ionic compounds

B. For covalent compound, the oxidation number is indicated by the charge that an atom of element would have acquired if the substance would have been ionic

C. Oxidation number may have integer or fractional values

D. None of these

Answer: A::B::C

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2. The process of oxidation involves:

A. addition of O_2 or removal of H_2 to a molecule

B. addition of a non-metal or removal of metal

C. loss of electrons

D. None of above

Answer: A::B::C

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3. Which of the following statements (s) is (are) correct?

A. All reactions are oxidation and reduction reactions

B. Oxidizing agent is itself reduced

C. Oxidation and reduction always go side by side

D. Oxidation number during reduction decreases

Answer: B::C::D

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4. In the following reaction,

$4P + 3KOH + 3H_2O \rightarrow 3KH_2PO_2 + PH_3$:

A. P is oxidized

B. P is reduced

C. KOH is reduced

D. P is neither oxidized nor reduced

Answer: A::B

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5. Which of the following statements (s) is (are) correct?

A. Oxidation of a substance is followed by reduction of another

B. Reduction of a substance is followed by oxidation of another

C. Oxidation and reduction are complementary reactions

D. It is not necessary that both oxidation and reduction should take place in the same reaction

Answer: A::B::C

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6. In the reacion ,

$$3Br_2 + 6CO_3^{2-} + 3H_2O \rightarrow Br^- + BrO_3^- + 6HCO_3^+$$

A. Bromide is oxidized and carbonate is reduced

B. Bromide is oxidized

C. Bromine is reduced

D. It is disproprtionation reaction or auto redox change

Answer: B::C::D

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7. Preparation of Cl_2 from HCl and MnO_2, involves the process of:

A. Oxidation of MnO_2

B. Reduction of MnO_2

C. Dehydration

D. Oxidation of chloride ion

Answer: B::D

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8. Which is / are disproportionation reaction (s) ?

A. $2RCHO \xrightarrow{Al(OEt)_3} RCOOCH_2R$

B. $4H_3PO_3 \xrightarrow{\Delta} 3H_3PO_4 + PH_3$

C. $PCl_5 \rightarrow PCl_3 + Cl_2$

D. $RCHO \xrightarrow{KOH} RCOOK + RCH_2OH$

Answer: A::B::D

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9. Thermal decomposition of $(NH_4)_2Cr_2O_7$ involves.

A. Oxidation of N

B. Reduction of Cr

C. Disproportionation of compound

D. Intermolecular redox process

Answer: A::B

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10. Which is the following reaction (s) is (are) not oxidation reduction?

A. $H^+ + OH^- \rightarrow H_2O$

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

C. $CaCO_3 \rightarrow CaO + CO_2$

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

Answer: A::C

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11. Which represents disproportionation?

A. $2Cu^{+} \rightarrow Cu^{2+} + Cu$

B. $2I_2 \rightarrow 5I^{-} + I^{5+}$

C. $Cu^{2+} + Zn \rightarrow Zn^{2+} + Cu$

D. $(NH)_4)_2Cr_2O_7 \rightarrow N_2 + Cr_2O_3 + 4H_2$

Answer: A::B

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12. White P reacts with caustic soda, the products are PH_3 and NaH_2PO_2. This reaction is an example of:

A. Oxidation-reduction

B. Disproportionation

C. Auto redox

D. Neutralization

Answer: A::B::C

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13. In the context of the reaction,

$4Fe + 3O_2 \rightarrow 4Fe^{3+} + 6O^{2-}$, which of the following statements is/are correct?

A. It is redox reaction

B. $Fe_{(s)}$ is a reducing agent

C. $Fe^{3+}_{(aq.)}$ is an oxidising agent

D. $Fe_{(s)}$ is reduced to $Fe^{3+}_{(aq.)}$

Answer: A::B::C

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14. In the reaction,

$Cl_2 + OH^- \rightarrow Cl^- + ClO_4^{-1} + H_2O$, chlorine is:

A. Oxidized

B. Reduced

C. Disproportionate

D. Neither oxidized nor reduced

Answer: A::B::C

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15. For the reaction, $2KClO_3 \rightarrow 2KCl + 3O_2$, which statements (s) are (are) correct?

A. It is disproprtionation

B. It is intramolecular redox change

C. Cl atoms are reduced

D. Oxygen atoms are oxidised

Answer: B::C::D

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16. Which of the following represents redox reactions?

A. $Cr_2O_7^{2-} + 2OH^- \rightarrow CrO_4^{2-} + H_2O$

B. $SO_3^{2-} + I^- \rightarrow I_2 + SO_4^{2-}$

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

D. $PCl_5 \rightarrow PCl_3 + Cl_2$

Answer: B::C::D

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17. Indicate in which of the following process the nitrogen is reduced?

A. $NH_4^+ \rightarrow N_2$

B. $NO_3^- \rightarrow NO$

C. $NO_2 \rightarrow NO_2^-$

D. $NO_3^{-1} \rightarrow NH_4^+$

Answer: B::C::D

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18. Which of the following are correct about the reaction,

$FeS_2 + O_2 \rightarrow Fe_2O_3 + SO_2$

A. Eq.wt.of FeS_2 is $M/11$

B. Eq.wt.of SO_2 is $M/5$

C. S has -2 oxidation state in FeS_2

D. 1 mole of FeS_2 requires $7/4$ mole of O_2

Answer: A::B

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Exercise 4 Objective Problems

1. When $KMnO_4$ acts as an oxidising agnet and ultimetely from MnO_4^{2-}, MnO_2, Mn_2O_3, and Mn^{2+}, then the number of electrons transferred in each case, respectively, are

A. $4, 3, 1, 5$

B. $1, 5, 3, 7$

C. $1, 3, 4, 5$

D. $3, 5, 7, 1$

Answer: C

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2. which of the following is a redox reaction ?

A. $NaCl \rightarrow KNO_3 \rightarrow NaNO_3 + KCl$

B. $CaC_2O_4 + 2HCl \rightarrow CaCl_2 + H_2C_2O_4$

C. $Mg(OH)_2 + 2NH_4Cl \rightarrow MgCl_2 + 2NH_4OH$

D. $Zn + 2AgCN \rightarrow 2Ag + Zn(CN)_2$

Answer: D

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3. Which reaction is possible at anode?

A. $2Cr^{3+} + 7H_2O \rightarrow Cr_2O_7^{2-} + 14H^+$

B. $F_2 \rightarrow 2F^-$

C. $O_2 + 4H^+ \rightarrow 2H_2O$

D. None of the above

Answer: A

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4. The oxidation state of nickel in $K_4Ni(CN)_4$ is:

A. $+1$

B. $+2$

C. -1

D. 0

Answer: D

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5. The oxidation state of Cr in $\left[Cr(NH_3)_4Cl_2\right]^+$ is:

A. $+3$

B. $+2$

C. $+1$

D. 0

Answer: A

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6. Which of the following reaction depicts the oxidsing behaviour of H_2SO_4?

A. $2HI + H_2SO_4 \rightarrow I_2 + SO_2 + 2H_2O$

B. $Ca(OH)_2 + H_2SO_4 \rightarrow CaSO_4 + 2H_2O$

C. $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

D. $2PCl_5 + H_2SO_4 \rightarrow 2POCl_3 + 2HCl + SO_2Cl_2$

Answer: A

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7. Amount of oxalic acid present in a solution can be determined by its titration with $KMnO_4$ solution in the presence of H_2SO_4. The titration gives unsatisfactory result when carried out in the presence of HCl, because HCl:

A. gets oxidised by oxalic acid to chlorine

B. furnishes H^+ ions in addition to those from oxalic acid

C. reduces permangante to Mn^{2+}

D. oxidises oxalic acid to carbon dioxide and water

Answer: C

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8. The oxidation number of S in S_8, S_2F_2, and H_2S, respectively, are

A. $0, +1$ and -2

B. $+2, +1$, and -2

C. $0, +1$ and $+2$

D. $-2, +1$ and -2

Answer: A

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9. Among the following identify the species with an atom in $+6$ oxidation state.

A. MnO_4^-

B. $Cr(CN)_6^{3-}$

C. NiF_6^{2-}

D. CrO_2Cl_2

Answer: D

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10. 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. $M/2$

B. $M/6$

C. $M/3$

D. M

Answer: B

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11. The reaction

$3ClO^{\ominus}(aq) \rightarrow ClO_3(aq) + 2Cl^{\ominus}(aq)$

is an example of

A. Oxidation reaction

B. Reduction reaction

C. Disproportionation

D. Decomposition

Answer: C

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12. Maximum oxidation state is present in

A. CrO_2Cl_2 and MnO_4^-

B. MnO_2

C. $\left[Fe(CN)_6\right]^{3-}$ and $\left[Co(CN)_6\right]^3$

D. MnO

Answer: A

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13. Oxidation states of the metal in the minerals haematite and magnetite, respectively, are

A. II,III in haematite and III in magnetite

B. II,III in haemitite and II in magnetite

C. II in a haematite and II, III in magnetite

D. III in haematite and II, III in magnetite

Answer: D

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14. The reaction of white phosphorus with aqueous $NaOH$ gives phosphine along with another phosphorus containing compound. The reacation type, the oxidation states of phosphorus in phosphine and the other product are respectvely:

A. redox reaction, -3 and -5

B. redox reaction , $+3$ and $+1$

C. disproportionation reaction, -3 and $+1$

D. disproportionation reaction , -3 and $+3$

Answer: C

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15. Which ordering of compound is according to the decreasing order of th e oxidation state of nitrogen?

A. HNO_3, NO, NH_4Cl, N_2

B. HNO_3, NO, N_2, NH_4Cl

C. HNO_3, NH_4Cl, NO, N_2

D. NO, HNO_3, NH_4Cl, N_2

Answer: B

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Exercise 6 Integer Answer Type Problems

1. Find the oxidation number of Mn in the product of alkaline oxidative fusion of MnO_2.

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2. 1 mole each of FeC_2O_4 and $FeSO_4$ is oxidised Calculate by $1MKMnO_4$ in acidic medium. Calculate the volume ratio of $KMnO_4$ used for FeC_2O_4 and $FeSO_4$.

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3. The value of x in the partial redox equation

$MnO_4^- + 8H^+ + xe \Leftrightarrow Mn^{2+} + 4H_2O$ is

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4. The equivalent weight of $KMnO_4$ in (a) neutral medium, (b) acidic medium and (c) alkaline medium is $M/..$ (where M is mol.wt. of $KMnO_4$)

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5. Calculate the oxidation numbers of Cr in K_3CrO_8:

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6. $2Mn_2O_7 \to 4MnO_2 + 3O_2$ (if M is m ol.wt. of Mn_2O_7). Find the equivalent weight of Mn_2O_7 in above change.

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7. 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.)

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8. The number of electrons lost in the following change is

$Fe + H_2O \rightarrow Fe_3O_4 + H_2$

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9. If $K_2Cr_2O_7$ is source of $Cr_2O_7^{2-}$, what is the normality of solution containing $4.9g$ of $K_2Cr_2O_7$ in 0.1 litre of solution?

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10. A $1.10g$ sample of copper ore is dissolved and the Cu^{2+} of is treated with excess KI. The liberated I_2 requires $12.12mL$ of $0.10MNa_2S_2O_3$ solution for titration. Find the $\%$ copper by mass in ore.

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11. 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

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12. Calculate the number of moles of Sn^{2+} ion oxidise by 1 mole of $K_2Cr_2O_7$ in acidic medium.

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13. In the equation

$NO_2^{\ominus} + H_2O \rightarrow NO_3^{\ominus} + 2H^{\oplus} + ne -$ n` stands for

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14. On combustion of CH_4 to CO_2 and H_2, the oxidation number of carbon changes by:

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15. Ammonium vanadate on theating with oxalic acid forms a compound (Z). A sample of (Z) was titrated with $1MKMnO_4$ solution in hot acidic medium. The resulting solution was reduced with SO_2, the excess of SO_2 is boiled out and the solution was again titrated with $1MKMnO_4$. The volume ratio of $KMnO_4$ used in two titrations was $5:1$. Given that $KMnO_4$ oxidised all oxidation states of vanadium to $+5$ and SO_2 reduced to $+4$. Find the oxidation state of V in Z`.

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16. Find the numbers of moles of As_2S_3 required to reduce 56 moles of HNO_3 according to reaction,

$As_2S_3 + HNO_3 \rightarrow H_3AsO_4 + H_2SO_4 + NO$

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17. Among the following , the number of elements showing only one non-zero oxidation state is:

$O, Ci, F, N, P, Sn, Tl, Na, Ti$

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18. The difference in the oxidation numbers of two types of sulphul atoms in $Na_2S_4O_6$ is.....

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Exercise 7 Comprehension Based Objective Problems

1. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced

themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant. Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

Select the species which can act as oxidant and reductant both :

(I) H_2SO_3, (II) H_2O_2 , (III) O_3 , (IV) HNO_3 , (V) Cl_2

A. I,II,III,IV

B. I,II,III,V

C. II,III,IV,V

D. III,IV,V

Answer: B

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2. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant. Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

Which of the following show intramolecular redox change?

(I) $2KClO_3 \rightarrow 2KCl + 3O_2$

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

(III) $NH_4NO_2 \rightarrow N_2 + 2H_2O$

(IV) $2Cu^+ \rightarrow Cu^{2+} + Cu$

A. I,II,III

B. I,IV

C. II,III

D. II,IV

Answer: A

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3. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant. Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

Which of the following shows auto-redox change ?

(I) $2HCHO + NaOH \rightarrow HCOONa + H_2O$

(II) $Cl_2 + H_2O \rightarrow HCl + HClO$

(III) $2Cu^{+} \rightarrow Cu^{2+} + Cu$

(IV) $Cr + 3H_2O + 3OCl^{-} \rightarrow 3Cl^{-} + 6OH^{-}$

A. I,II,III

B. I,IV

C. II, IV

D. II, III

Answer: A

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4. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant. Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

Six mole of Cl_2 undergoes a loss and gain of 10 mole of electrons to form two oxidation state of cl. The balance redox change is :

A. $6Cl_2 \rightarrow 6Cl^- + 6Cl + 0e$

B. $Cl_2 + 5Cl_2 \rightarrow 10Cl^- + 2Cl^{5+} + 0e$

C. $3Cl_2 + 3Cl_2 \rightarrow 6cl^- + 6cl^{3+} + 12e$

D. $2Cl_2 + 4Cl_2 \rightarrow 4Cl^- + 8Cl^+ + 4e$

Answer: B

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5. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant.

Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

In which of the following H_2O_2 acts as reductant ?

(I) $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$

(II) $PbO_2 + H_2O_2 \rightarrow PbO + H_2O + O_2$

(III) $HCHO + H_2O_2 \rightarrow HCOOH + H_2O$

(IV) $Cl_2 + H_2O_2 \rightarrow 2HCl + O_2$

A. I, II, IV

B. I,II,III

C. I,IV

D. II,III

Answer: A

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6. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant. Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

Which statement is wrong about CrO_5 ?

A. It has butterfly structure

B. Oxidation number of Cr is $+10$

C. Oxidation number of Cr is $+6$

D. It reacts with H_2SO_4 to give $Cr_2(SO_4)_3$ and O_2

Answer: B

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7. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant. Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

Maximum oxidation state shown by Os, Ru and Xe in their compounds is :

A. $+8$

B. $+6$

C. $+10$

D. $+4$

Answer: A

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8. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant. Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

Oxidation number of oxygen in K_2O, K_2O_2, KO_2, KO_3 are in the order :

A. $KO_3 < KO_2 < K_2O_2 < K_2O$

B. $KO_2 < KO_3 < K_2O < K_2O_2$

C. $K_2O < K_2O_2 < KO_2 < KO_3$

D. $KO_3 < K_2O < KO_2 < K_2O_2$

Answer: C

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9. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant. Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

What is the percentage of Fe^{3+} in $Fe_{0.93}O_{100}$?

A. $15.05\ \%$

B. $84.95\ \%$

C. $20\ \%$

D. $80\ \%$

Answer: A

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10. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant. Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

Oxidation number of Y in $YBa_2Cu_3O_7$ is $+3$, then oxidation number of Cu is :

A. $+7/3$

B. $+5/3$

C. $+2$

D. $+1$

Answer: A

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11. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant. Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

Select the oxidant in the reaction,

$F_2 + 1/2O_2 \rightarrow F_2O$

A. F_2

B. O_2

C. Either of these

D. $+1$

Answer: A

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12. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant. Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

The missing terms in the reaction :

$$Cr_2O_7^{2-} + 14H^+ + ? \rightarrow 2Cr^{3+} + 7H_2O$$

A. $6e$

B. $12e$

C. $10e$

D. $3e$

Answer: A

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13. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant.

Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

Total number of electrons transferred during the change :

$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

A. $2e$

B. $4e$

C. $6e$

D. $8e$

Answer: D

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14. Oxidation is de-electronation whereas reduction is electronation. Oxidants are the substances which oxidise others and reduced themselves. On the other hand reductants are the substances which

reduce others and oxidised themselves. The oxidation number of an element in a compound decides its nature to act as oxidant or reductant. Oxidation-reduction occur simultaneously and the overal chemical change is called redox reaction. Redox reactions are of three types :

(i) Intermolecular erdox reactions, (ii) Auto-redox or disproportionation reaction, and (iii) Intramolecular redox reactions.

$Ox.$ no. of Fe in $FeSO_4.NO$ is :

A. $+1$

B. $+2$

C. $+3$

D. Zero

Answer: A

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15. The equivalent weight of a species if acts as oxidant or reductant should be derived by :

Eq. weight of oxidant or reductant

$$= \frac{\text{Mol. wt. of oxidant or reductant}}{\text{Number of electrons lost or gained by one moleculae of oxidant or reductant}}$$

During chemical reactions, equal equivalents of one species react with same number of equivalents of other species giving same number of equivalent of products. However this is not true for reactants if they react in terms of moles. Also Molarity can be converted to normality by multiplying the molarity with valence factor or $'n'$ factor.

Equivalent weight of Fe_2O_3 in terms of its mol. weight in the change $Fe_3O_4 \rightarrow Fe_2O_3$ is

A. M

B. $M/2$

C. $M/3$

D. $3M/2$

Answer: D

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16. The equivalent weight of a species if acts as oxidant or reductant should be derived by :

Eq. weight of oxidant or reductant

$$= \frac{\text{Mol. wt. of oxidant or reductant}}{\text{Number of electrons lost or gained by one moleculae of oxidant or reductant}}$$

During chemical reactions, equal equivalents of one species react with same number of equivalents of other species giving same number of equivalent of products. However this is not true for reactants if they react in terms of moles. Also Molarity can be converted to normality by multiplying the molarity with valence factor or $'n'$ factor.

Equivalent weight of N_2 and NH_3 in the change $N_2 \rightarrow NH_3$ respectively is:

A. $4.67, 12.4$

B. $9.3, 12.4$

C. $4.67, 5.34$

D. $5.34, 4.67$

Answer: C

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17. The equivalent weight of a species if acts as oxidant or reductant should be derived by :

Eq. weight of oxidant or reductant

$$= \frac{\text{Mol. wt. of oxidant or reductant}}{\text{Number of electrons lost or gained by one moleculae of oxidant or reductant}}$$

During chemical reactions, equal equivalents of one species react with same number of equivalents of other species giving same number of equivalent of products. However this is not true for reactants if they react in terms of moles. Also Molarity can be converted to normality by multiplying the molarity with valence factor or $'n'$ factor.

The equivalent weight of an element is 13.16. It forms an acidic oxide which with KOH forms a salt isomorphous with K_2SO_4. The atomic weight of element is:

A. 78.96

B. 52.64

C. 26.32

D. 39.48

Answer: A

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18. The equivalent weight of a species if acts as oxidant or reductant should be derived by :

Eq. weight of oxidant or reductant

$$= \frac{\text{Mol. wt. of oxidant or reductant}}{\text{Number of electrons lost or gained by one moleculae of oxidant or reductant}}$$

During chemical reactions, equal equivalents of one species react with same number of equivalents of other species giving same number of equivalent of products. However this is not true for reactants if they react in terms of moles. Also Molarity can be converted to normality by multiplying the molarity with valence factor or $'n'$ factor.

One mole of As_2S_3 is oxidised by HNO_3 to H_3AsO_4 and H_2SO_4. HNO_3 is converted into NO. The moles of HNO_3 required are:

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

B. $\frac{28}{3}$

C. 14

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

Answer: B

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19. The number of moles of $KMnO_4$ required to oxidise $1mol$ of $Fe(C_2O_4)$ in acidic medium is

A. $3/5$

B. $5/3$

C. $2/5$

D. $1/5$

Answer: A

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20. The equivalent weight of a species if acts as oxidant or reductant should be derived by :

Eq. weight of oxidant or reductant

$$= \frac{\text{Mol. wt. of oxidant or reductant}}{\text{Number of electrons lost or gained by one moleculae of oxidant or reductant}}$$

During chemical reactions, equal equivalents of one species react with same number of equivalents of other species giving same number of equivalent of products. However this is not true for reactants if they react in terms of moles. Also Molarity can be converted to normality by multiplying the molarity with valence factor or $'n'$ factor.

$20mL0.2MMnSO_4$ are completely oxidised by $16mL$ of $KMnO_4$ of unknown normality each forming Mn^{4+} oxidation state. The normality and molarity of $KMnO_4$ are respectively:

A. $0.5, 0.167$

B. $0.167, 0.5$

C. $0.5, 0.1$

D. $0.1, 0.5$

Answer: A

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Exercise 8 Statement Explanation Type Problems

1. Statement Oxidation number of Cu in CuH is -1

Explanation Cu is placed below H in electro-chemical series.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

Watch Video Solution

2. Statement Oxidation state of H is $+1$ in CuH_2 and -1 in CaH_2

Explanation Ca is strong electropositve metal.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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3. Statement Oxygen atom in both O_2 and O_3 has oxidation number zero.

Explanation In F_2O, oxidation number of O is $+2$.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: D

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4. Statement N atom has two different oxidation states in NH_4NO_2.

Explanation One N atom has-ve oxidation number as it is attached with less electronegative H-atom and other has $+ve$ oxidation number as it is attached with more electronegative atom.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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5. Statement $2H_2O_2 \rightarrow 2H_2O + O_2$ is autoredox change.

Explanation One oxygen atom is oxidised and one oxygen atom is reduced.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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6. Statement Oxidation number of metals in metal carbonyls is zero.

Explanation The oxidation number of CO has been taken to be zero.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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7. Statement SO_2 can be used as reductant as well as oxidant.

Explanation The oxidation number of S in $+4$ in SO_2 which lies between its minimum (-2) and maximum $(+6)$ values.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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8. Statement $KMnO_4$ is strong oxidant whereas Mn^{2+} is weaker reductant.

Explanation Stronger is the oxidant weaker is its conjugate reductant.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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9. Statement VO_2^+ and VO^{2+} both are called vanadyl ions.

Explanation VO_2^+ is dioxovanadium (V) ion and VO^{2+} is oxovanadium (IV) ion.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: D

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10. Statement In the reactions ,

$3As_2S_3 \rightarrow 28HNO_3 + 4H_2O \rightarrow 6H_3AsO_4 + 9H_2SO_4 + 28NO$

electrons transferred are 84.

Explanation As is oxidised from $+3$ to $+5$ and sulphur from -2 to $+6$

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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11. Statement In acidic medium equivalent weight of $K_2Cr_2O_7$ is 49.

Explanation $\left(Cr^{6+}\right)_2 + 6e \rightarrow 2Cr^{3+}$, Thus $E = \frac{M}{6}$

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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12. Statement Iodimetric titrations are redox titrations.

Explanation The iodine solution acts as an oxidant to reduce the

reductant.

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

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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13. Statement The redox titarations in which liberated I_2 is used as oxidant are called as idometric titration.

Explanation Addition of KI to $CuSO_4$ liberates I_2 which is estimated against hyposolution.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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14. Statement $KMnO_4$ acts as oxidant as well as self indicator in its titration with Ferrous ammonium sulphate solution in acidic medium. Explanation $KMnO_4$ reduces itself to Mn^{2+} ions and oxidises Fe^{2+} to Fe^{3+} as well as after redox reaction is complete, the $KMnO_4$ at the equivalence point imparts pink colour.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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15. Statement The equivalence point refers the condition where equivalents of one species reacts with same number of equivalent of other species.

Explanation The end point of titration is exactly equal to equivalence point.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: A

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16. Statement The equivalence weight of $KMnO_4$ when it is converted to K_2MnO_4 is equal to its molecular weight.

Explanation $Mn^{7+} + e \rightarrow Mn^{6+} \therefore E = \frac{M}{1}$

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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17. Statement The number of equivalent per mole of H_2S used in its oxidation to SO_2 is six.

Explanation $S^{2-} \rightarrow S^{4+} + 6e$

$\therefore \text{Equivalent} = \text{Mole} \times 6$

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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18. Statement Starch is generally used as absorption indicator in iodimetric or iodometric titrations.

Explanation Starch imparts blue colour with iodine.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: C

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19. Statement The oxidation number of an element in its free or uncombined from is zero.

Explanation The oxidation number of a monoatomic cation or anion is equal to its charge.

A. S is correct but E is wrong.

B. S is wrong but E is correct.

C. Both S and E are correct and E is correct explanation of S

D. Both S and E are correct but E is not correct explanation of S.

Answer: D

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