CHEMISTRY

JEE MAIN AND ADVANCED

REDOX REACTIONS

Example

1. In the given reaction, identify the species undergoing oxidation and reduction

(i) $Mg + S \rightarrow MgS$

(ii) $2HgO \rightarrow 2Hg + O_2$

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2. Using electronic concept, identify the oxidant and reductant in the following redox reactions.

(i) $Zn + 2H^+ \rightarrow Zn^{+2} + H_2$

$(ii) BrO_3^- + F_2 + 2OH^- \rightarrow BrO_4^- + 2F^- + H_2O$

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3. Calculate the oxidation number of 'O' in H_2O molecule.

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4. Calculate the oxidatioin number of S in SO_4^{2-} ion.

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5. Oxidation number of N in $(NH_4)_2SO_4$ is

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6. Calculate the oxidation number of Mn in $KMnO_4$ molecule.

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7. Select the oxidising agent and the reducing agent from the following reaction :

$$\underset{\text{Hydrogen sulphide}}{H_2S} + \underset{\text{Iodine}}{I_2} \rightarrow \underset{\text{Hydrogen iodide}}{2HI} + \underset{\text{Sulphur}}{S}$$

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8. Justify that the reaction

$2Cu_2O_s + Cu_2S(s) \rightarrow 6Cu(s) + SO_2(g)$ a redox reaction.

Identify the species oxidised / reduced. Which acts as an oxidanat and which acts as a reductant?

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9. Classify the following redox reactions:

a. $N_2(g) + O_2(g) \rightarrow 2NO(g)$

b. $2Pb(NO)_3(s) \rightarrow 2PbO(s) + 2NO_2(g) + \frac{1}{2}O_2(g)$

c. $NaH(s)H_2O(l) \rightarrow NaOH(aq) + H_2(g)$

d. $2NO_2(g) + 2\overset{\ominus}{O}H(aq) \rightarrow NO_2^{\ominus}(aq) + NO_3^{\ominus}(aq) + H_2O(l)$

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10. How does Cu_2O act as both oxidant and reductant ?

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11. Which one of two , ClO_2^- or ClO_4^- shows disproportionation reaction and why ?

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12. Balance the equation

$$Mg + HNO_3 \rightarrow Mg(NO_3)_2 + N_2O + H_2O$$

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13. Balance the following equation stepwise:

$$Cr_2O_7^{2-} + Fe^{2+} + + H^{\oplus} \rightarrow Cr^{3+} + Fe^{3+} + H_2O$$

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14. Balance the following by ion electron method (basic medium):

$Cr(OH)_3 + IO_3^{\ominus} \rightarrow I^{\ominus} + CrO_4^{2-}$

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15. Balance the net equtation fro th reaction of potassium dichromate (VI), $K_2Cr_2O_7$, with sodium sulphite, Na_2SO_3, in an acid solution to give chromium (III) ion and and sulphate ion.

Strategy : Follow the seven -step proceduce , one step at a time.

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16. Balance the redox reaction by half reaction method :

$Br_2 + H_2O_2 \rightarrow BrO_3^- + H_2O$ (in acidic medium)

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17. In passing chlorine gas through a concentrated solution of alkali we get chloride and chlorate ions Obtain balanced chemical equation for this reaction.

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18. Balance the following by ion electron method is basic medium.

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

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19. Balance the equation by ion electron method

$MnO_4^- + Br^- \rightarrow Mn^{2+} + Br_2$ (acidic medium)

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20. The half cell reactions with reduction potentials are

$Pb(s) \rightarrow Pb^{+2}(aq), E^{\circ}_{\text{red}} = -0.13V$

$Ag(s) \rightarrow Ag^{+}(aq), E^{\circ}_{\text{rod}} = +0.80V$

Calculate its emf.

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21. Can a solution of 1 M copper sulphate be stored in a vessel made of nickel metal? Given that

$E^{\circ}_{Ni^{+2}/Ni} = 0.25$ volt and $E^{\circ}_{Cu^{+2}/Cu} = +0.34$ volt.

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22. $\underset{(aq)}{Cr_2O_7^{-2}} + \underset{(aq)}{SO_3^{-2}} \rightarrow \underset{(aq)}{Cr^{+3}} + \underset{(aq)}{SO_4^{-2}}$ (Acidic medium)

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23. $\underset{(aq)}{MnO_4^-} + \underset{(aq)}{Br^-} \rightarrow \underset{(aq)}{MnO_2} + \underset{(aq)}{BrO_3^-}$

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24. In the given reaction, identify the species undergoing oxidation and reduction

(i) $Mg + S \rightarrow MgS$

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26. Calculate the oxidation number of 'O' in H_2O molecule.

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28. Oxidation number of N in $(NH_4)_2SO_4$ is

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29. Calculate the oxidation number of Mn in $KMnO_4$ molecule.

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30. Identify the species undergoing oxidation & reduction and oxidising agent & reducing agent in the reaction.

$I_2(g) + H_2S(g) \rightarrow 2HI(g) + S(s)$

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31. Justify that the reaction is a redox reaction.

$$2Cu_2O(s) + Cu_2S(s) \rightarrow 6Cu(s) + SO_2(g)$$

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32. Classify the following redox reactions.

$N_2 + O_2 \rightarrow 2NO$

$NaH + H_2O \rightarrow NaOH + H_2$

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33. How does Cu_2O act as both oxidant and reductant ?

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34. Which of the following species, do not show disproportionation reaction and why ?

ClO^-, ClO_2^-, ClO_3^- and ClO_4^-

Also write reaction for each of the species that disproportionates.

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35. Balance the equation

$$Mg + HNO_3 \rightarrow Mg(NO_3)_2 + N_2O + H_2O$$

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36. For the redox reaction

$$xFe^{2+} + yCr_2O_7^{2-} + zH^+ \rightarrow Fe^{3+} + Cr^{3+} + H_2O$$

x, y and z are

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37. Balance the following by ion electron method (basic medium):

$Cr(OH)_3 + IO_3^{\ominus} \rightarrow I^{\ominus} + CrO_4^{2-}$

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

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42. Balance the equation by ion electron method

$MnO_4^- + Br^- \rightarrow Mn^{2+} + Br_2$ (acidic medium)

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43. The half cell reactions with reduction potentials are

$Pb(s) \rightarrow Pb^{+2}(aq), E^\circ_{\text{red}} = -0.13V$

$Ag(s) \rightarrow Ag^+(aq), E^\circ_{\text{rod}} = +0.80V$

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$E^\circ_{Ni^{+2}/Ni} = 0.25$ volt and $E^\circ_{Cu^{+2}/Cu} = +0.34$ volt.

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Try Yourself

1. Write the half reaction for the reaction

$2Fe^{+3} + 2I^{-} \rightarrow 2Fe^{+2} + I_2$

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2. identify oxidation and reduction process for the reaction

$CH_2 = CH_2 + H_2 \rightarrow CH_3 - CH_3$

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3. Find the oxidation number of Cl in HCl, $HClO$, $ClO_4^{\ominus}$, and $Ca(Ocl)Cl$.

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4. What is the oxidation number of the underlined atoms in the following :

(a) $Na_2Cr_2O_7$

(b) Na_3PO_4

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5. Identify the oxidant the reductant in the following reaction.

$Cl_2(g) + 2Br^-(aq) \rightarrow 2Cl^-(aq) + Br_2(aq)$

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6. Is the reaction $BaO_2 + H_2SO_4 \rightarrow BaSO_4 + H_2O_2$ a redox reaction?

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7. Write the disproportionation reaction of ClO^- to Cl^- and ClO_3^-

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8. Classify the reaction

$(i) 2NO_2 + 2OH^- \rightarrow NO_2^- + H_2O$

(ii) $2Pb(NO_3)_2 \rightarrow 2PbO + 2NO_2 + \frac{1}{2}O_2$

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9. In the balanced equation

$MnO_4^- + H^+ + C_2O_4^{2-} \rightarrow Mn^{2+} + CO_2 + H_2O$, the moles of CO_2 formed are :-

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10. Balance the following reaction by ion electrons method (acidic medium).

$As_2S_3 - NO_3^{\ominus} \rightarrow S + NO_2 + AsO_4^{3-}$

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11. Balance the equation in acidic medium

$H_2S + Fe^{3+} \rightarrow Fe^{3+} + S + H^+$

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12. Balance the equation in basic medium

$$Al + NO_3^- \rightarrow Al(OH)_4^- + NH_3$$

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13. Why blue colour of $CuSO_4$ solution gets discharged when zinc rod is dipped in it ? Given, $E^{\circ}_{Cu^{+2}/Cu} = 0.34V$ and $E^{\circ}_{Zn^{+2}/Zn} = -0.76V$

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14. Can a solution of 1 M $ZnSO_4$ be stored in a vessel made of copper ? Given that $E^{\circ}_{Zn^{+2}/Zn} = -0.76V$ and $E^{\circ}_{Cu^{+2}/Cu} = 0.34V$

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15. Write the half reaction for the reaction

$2Fe^{+3} + 2I^{-} \rightarrow 2Fe^{+2} + I_2$

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16. identify oxidation and reduction process for the reaction

$CH_2 = CH_2 + H_2 \rightarrow CH_3 - CH_3$

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17. Determine the oxidation number of Cl in $HCl, HOCl, HClO_4$ and ClO_2.

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18. What is the oxidation number of the underlined atoms in the following :

(a) $Na_2Cr_2O_7$

(b) Na_3PO_4

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19. Identify the oxidant the reductant in the following reaction.

$Cl_2(g) + 2Br^-(aq) \rightarrow 2Cl^-(aq) + Br_2(aq)$

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20. Is the reaction $BaO_2 + H_2SO_4 \rightarrow BaSO_4 + H_2O_2$ a redox reaction?

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21. Write the disproportionation reaction of ClO^- to Cl^- and ClO_3^-

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22. Classify the reaction

$$2NO_2 + 2OH^- \rightarrow NO_2^- + NO_3^- + H_2O$$

$$2Pb(NO_3)_2 \rightarrow 2PbO + 2NO_2 + \frac{1}{2}O_2$$

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23. Balance the equation by lon-electron method

(ii) $MnO_4^- + H_2C_2O_4 \rightarrow Mn^{2+} + CO_2$ (In acidic medium)

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24. Balance the equation,

$As_2S_3 + NO_3^- \rightarrow AsO_4^{3-} + NO + S$ (in acidic medium).

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25. Balance the equation in acidic medium

$H_2S + Fe^{3+} \rightarrow Fe^{2+} + S + H^+$

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26. Balance the equation in basic medium

$Al + NO_3^- \rightarrow Al(OH)_4^- + NH_3$

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Assignment Section A Objective Type Questions One Option Is Correct

1. A redox reaction is:

A. Proton transfer reaction

B. Neutron transfer

C. Double displacement

D. Electron transfer reaction

Answer: D

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2. The reaction of $H_2S + H_2O_2 \rightarrow S + 2H_2O$ manifests

A. Oxidising action of H_2O_2

B. Reducing nature of H_2O_2

C. Acidic nature of H_2O_2

D. Alkaline nature of H_2O_2

Answer: A

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

A. Oxidation

B. Reduction

C. Disproportionation

D. Neutralisation

Answer: C

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4. The conversion of $K_2Cr_2O_7$ into $Cr_2(SO_4)_3$ is

A. Oxidation

B. Reduction

C. Decomposition

D. Substitution

Answer: B

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5. In this reaction $2Na_2S_2O_3 + I_2 \rightarrow Na_2SO_4O_6 + 2NaI_2$, NaI_2acts as:

A. Reducing agent

B. Oxidising agent

C. Oxidising agent

D. None of these

Answer: B

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6. The oxidation number of nitrogen in NH_2OH is :

A. Zero

B. $+1$

C. -1

D. -2

Answer: C

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7. When $KMnO_4$ is reduced with oxalic acid in acidic solution, the oxidation number of Mn changes from

A. $+7$ to $+2$

B. $+7$ to $+4$

C. $+7$ to $+6$

D. $+6$ to $+2$

Answer: A

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8. In which of the following reactions the underlined substance is oxidised?

A. $3Mg + \underline{N_2} \rightarrow Mg_3N_2$

B. $2Kl + \underline{Br_2} \rightarrow 2KBr + I_2$

C. $\underline{Cu}O + H_2O$

D. $\underline{C}O + Cl_2 \rightarrow COCl_2$

Answer: D

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9. The oxidation state of phosphorus vary from

A. -1 to $+1$

B. -3 to $+3$

C. -3 to $+5$

D. -5 to $+1$

Answer: C

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10. In which of the following reactions, the underlined element has decreased its oxidation number during the reaction?

A. $Fe + CuSO_4 \rightarrow Cu + \underline{Fe}SO_4$

B. $\underline{H_2} + Cl_2 \rightarrow 2\underline{H}Cl$

C. $\underline{C} + H_2O \rightarrow \underline{CO} + H_2$

D. $\underline{Mn}O_2 + 4HCl \rightarrow \underline{Mn}Cl_2 + Cl_2 + 2H_2O$

Answer: D

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11. A metal ion M^{3+} loses three electrons , its oxidation number will be

A. Zero

B. $+6$

C. $+2$

D. $+4$

Answer: B

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12. In which one of the following changes there are transfer of five electrons?

A. $MnO_4^- \rightarrow Mn^{2+}$

B. $CrO_4^{2-} \rightarrow Cr^{3+}$

C. $MnO_4^- \rightarrow MnO_2$

D. $Cr_2O_7^{2-} \rightarrow 2Cr^{3+}$

Answer: A

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13. 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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14. The oxidation number of chlorine in HOCl is

A. -1

B. Zero

C. $+1$

D. $+2$

Answer: C

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15. In the reaction,

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

A. Oxidised

B. Reduced

C. oxidising as well as reduced

D. Neither oxidised nor reduced

Answer: C

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16. The oxidation number of P in $Mg_2P_2O_7$ is

A. $+3$

B. $+2$

C. $+5$

D. -3

Answer: C

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17. For the redox reaction,

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

the correct coefficients of the reactants for the balanced reaction are

A.	MnO_4^-	$C_2O_4^{2-}$	H^+
	2	5	16
B.	MnO_4^-	$C_2O_4^{2-}$	H^+
	16	5	2
C.	MnO_4^-	$C_2O_4^{2-}$	H^+
	5	16	2
D.	MnO_4^-	$C_2O_4^{2-}$	H^+
	2	16	5

Answer: A

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18. Oxygen has an oxidation state of +2 in

A. H_2O_2

B. OF_2

C. SO_2

D. H_2O

Answer: B

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

A. ABC_2

B. $B_2(AC_3)_2$

C. $A_3(BC_4)_2$

D. $A_3(B_4C)_2$

Answer: C

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20. In which of the following pairs. the oxidation states, of sulphuric and chromium are same?

A. SO_3^{2-}, CrO_4^{2-}

B. SO_3, CrO_4^{2-}

C. SO_2, CrO_4^{2-}

D. $SO_2, Cr_2O_7^{2-}$

Answer: B

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21. The oxidation number of sulphur 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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22. Oxidation number of C in HNC is :

A. $+2$

B. -3

C. $+3$

D. Zero

Answer: A

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23. 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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24. Which of the following molecules can act as an oxidising agent as well as a reducing agent ?

A. H_2S

B. SO_3

C. H_2O_2

D. F_2

Answer: C

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25. The oxidation state of iodine in ICI_3 is

A. $+1$

B. $+3$

C. $+5$

D. $+7$

Answer: B

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26. The pair of compounds having metals in their highest oxidation state is .

A. $MnO_2, FeCl_3$

B. MnO_4^-, CrO_2Cl_2

C. $CuCl, HgCl$

D. $FeCl_2, FeSO_4$

Answer: B

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27. 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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28. Number of moles of MnO_4^- required to oxidise one mole of ferrous oxalate completely in acidic medium will be

A. 7.5 moles

B. 0.2 moles

C. 0.6 moles

D. 0.4 moles

Answer: C

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29. The reaction, $P_4 + 3NaOH + 3H_2O \rightarrow 3NaH_2PO_2 + PH_3$ is an example of

A. Disproportionation reaction

B. Neutralization reaction

C. Double decomposition reaction

D. Displacement reaction

Answer: A

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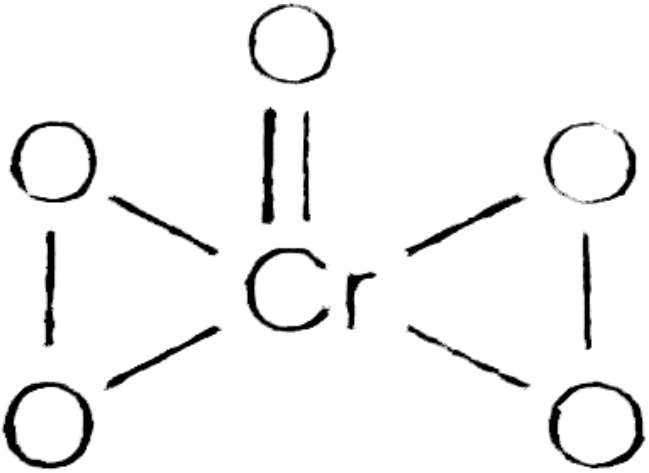
30. CrO_4 has structure as shown



The oxidation number of chromium in the above compound is

A. $+4$

B. $+5$

C. $+6$

D. $+10$

Answer: C

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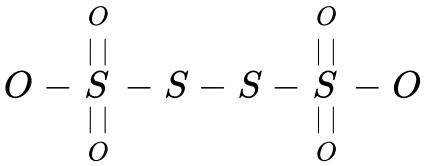
31. The oxidation states of S atom in $S_4O_6O^{2-}$ from left to right respectively are



A. $+6, 0, 0, +6$

B. $+3, +1, +1, +3$

C. $+5, 0, 0, +5$

D. $+4, +1, +1, +4$

Answer: C

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32. The oxidation number of phosphorus in PO_4^{3-}, P_4O_{10}, and $P_2O_7^{4-}$ is

A. $+5$

B. $+3$

C. -3

D. $+2$

Answer: A

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33. The reaction

$$5H_2O_2 + XClO_2 + 2OH^- \rightarrow XCl^- + YO_2 + 6H_2O$$

is balanced if

A. X=5,Y=2

B. X=2,Y=5

C. X=4,Y=10

D. X=5,Y=5

Answer: B

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34. Nitrogen forms a variety of compounds in all oxidation states ranging from:

A. -3 to +5

B. -3 to +3

C. -3 to +4

D. -3 to +6

Answer: A

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35. $KMnO_4$ is a strong oxidising agent in acidic medium. To provide acidic medium H_2SO_4 is used instead of HCl. This is because

A. H_2SO_4 is a stronger acid than HCl

B. HCl is oxidised by $KMnO_4$ to Cl_2

C. H_2SO_4 is dibasic acid

D. Rate is faster in the presence of H_2SO_4

Answer: B

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36. Oxidation state of P in $H_4P_2O_5, H_4P_2O_6, H_4P_2O_7$ are respectively

A. $+3, +5, +4$

B. $+5, +3, +4$

C. $+5, +4, +3$

D. $+3, +4, +5$

Answer: D

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37. In this reaction: $S_2O_8^{2-} + 2I^- \rightarrow 2SO_4^{2-} + I_2$

A. Oxidation of iodide into iodine takes place

B. Reduction of iodine into iodide takes place

C. Both oxidation and reduction of iodine takes place

D. All of these

Answer: A

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38. Which of the following has the highest value of E°_{rod} ?

A. P_4

B. Cl_2

C. I_2

D. F_2

Answer: D

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39. Among these, identify the species with an atom in $+6$ oxidation state: .

A. CrO_2Cl_2

B. $\left[Cr(CN)_6\right]^{3-}$

C. MnO_4^-

D. $\left[NiF_6\right]^{3-}$

Answer: A

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40. The oxidant which cannot act as a reducing agent is

A. CO_2

B. NO_2

C. SO_2

D. ClO_2

Answer: A

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Assignment Section B Objective Type Questions One Option Is Correct

1. Which of the following is a Redox reaction ?

A. $CaCO_3 \rightarrow CaO + CO_2$

B. $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

C. $NaOH + HCl \rightarrow NaCl + H_2O$

D. $KClO_3 \rightarrow KCl + \frac{3}{2}O_2$

Answer: D

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2. In the reaction $2Ag + 2H_2SO_4 \rightarrow Ag_2SO_4 + 2H_2O + SO_2$, H_2SO_{40}acts as a/an

A. Oxidising agent

B. Reducing agent

C. Oxidising as well as reducing agent

D. Catalyst

Answer: A

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3. Which can act as an oxidising as well as a reducing agent ?

A. $HClO_4$

B. HNO_3

C. H_2SO_4

D. H_2O_2

Answer: D

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4. The number of electrons required to balance the following equation are :

$$NO_3^- + 4H^+ \rightarrow 2H_2O + NO$$

A. 5

B. 4

C. 3

D. 2

Answer: C

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5. Which of the following statement is correct about oxidation number ?

A. Oxidation number of all atoms in elementary state is zero

B. The sum of Oxidation number of all the atoms in the formula of a compound is always zero

C. Alkali and alkaline earth metals have +1 and +2 oxidation staes respectively

D. All of these

Answer: D

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6. Which can act as a reducing agent ?

A. HNO_3

B. H_2SO_4

C. H_2S

D. $KMnO_4$

Answer: C

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7. The oxidation number of Fe in $Fe_{0.94}O$ is

A. $+2$

B. $+3$

C. $+\frac{200}{94}$

D. $\frac{8}{3}$

Answer: C

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8. In this reaction $4Al + 3O_2 \rightarrow 4Al^{3+} + 6O^{2-}$ which of the following statement is incorrect ?

A. It is a redox reaction

B. Metallic aluminium is a reducing agent

C. Metallic aluminium is oxidised to Al^{3+}

D. Metallic aluminium is reducing to Al^{3+}

Answer: D

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9. Calculate the oxidation numbers of Cr in K_3CrO_8:

A. $+6$

B. $+5$

C. $+3$

D. $+2$

Answer: B

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10. Peroxides are basic in nature and they form hydrogen peroxides on treatment with acid. What volume of 0.5 M H_2SO_4 solution is required to neutralise a solution containing 7.2 g of CaO_2 ?

A. 400 ml

B. 300 ml

C. 200 ml

D. 100 ml

Answer: C

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11. What is the difference in oxidation state of nitrogen in between hydroxyl amine (NH_2OH) and hydrazine (N_2H_4) ?

A. $+5$

B. $+3$

C. -3

D. 1

Answer: D

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12. In which one of the following changes there are transfer of five electrons?

A. $MnO_4^- \rightarrow Mn^{2+}$

B. $CrO_4^{2-} \rightarrow Cr^{3+}$

C. $MnO_4^- \rightarrow MnO_2$

D. $Cr_2O_7^{2-} \rightarrow 2Cr^{3+}$

Answer: A

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13. How many gm of $K_2Cr_2O_7$ is present in 1 L of its N/10 solution in acid medium ?

A. 4.9

B. 49

C. 0.49

D. 3.9

Answer: A

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14. When Cu_2S is converted into Cu^{2+} & SO_2 then equivalent weight of Cu_2S will be (M=mol. Wt. of Cu_2S)

A. M

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

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

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

Answer: D

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15. Which of the following changes involve reduction ?

A. The conversion of ferrous sulphate to ferric sulphate

B. The conversion of H_2S to S

C. The conversion of Cl_2 to $NaCl$

D. The conversion of Zn to $ZnSO_4$

Answer: C

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16. $FeS \rightarrow Fe^{3+} + SO_3$

Eq. wt. of FeS for this change is (mol. Wt. of FeS=M)

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

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

C. $\frac{M}{7}$

D. $\frac{M}{9}$

Answer: D

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17. The reaction

$Cl_2 + S_2O_3^{2-} + OH^- \rightarrow SO_4^{2-} + Cl^- + H_2O$

Starting with 0.15 mole Cl_2 , 0.010 mole $S_2O_3^{2-}$ and 0.30 mole OH^- mole of Cl_2 left in solution will be

A. 0.11

B. 0.01

C. 0.04

D. 0.09

Answer: A

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18. 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. $3/5$

B. $2/5$

C. $4/5$

D. $1/5$

Answer: A

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19. 200 ml of 0.01 M $KMnO_4$ oxidise 20 ml of H_2O_2 sample in acidic medium. The volume strength of H_2O_2 is

A. 2.8 volume

B. 5.6 volume

C. 0.5 volume

D. 0.25 volume

Answer: A

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20. If equal volumes of 1 M $KMnO_4$ and 1M $K_2Cr_2O_7$ solutions are allowed to oxidise Fe(II) to Fe(III) in acidic medium, then Fe(II) oxidised will be

A. More with $KMnO_4$

B. More with $K_2Cr_2O_7$

C. Equal with both oxidising agent

D. Cannot be determined

Answer: B

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21. 4 mole of a mixture of Mohr's salt and $Fe_2(SO_4)_3$ requires 500mL of $1MK_2Cr_2O_7$ for complete oxidation in acidic

medium. The mole % of the Mohr's salt in the mixture is:

A. $40\ \%$

B. $5\ \%$

C. $50\ \%$

D. $25\ \%$

Answer: D

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

A. 8 ml

B. 16 ml

C. 32 ml

D. 64 ml

Answer: B

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23. The stoichiometric coefficient of S in the following reaction

$H_2S + HNO_3 \rightarrow NO + S + H_2O$

is balanced (in acidic medium):

A. 1

B. 2

C. 3

D. 4

Answer: C

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24. $12.53mL$ 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.

A. 3

B. $+2$

C. 1

D. 0

Answer: D

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25. A sample of $NaHCO_3 + Na_2CO_3$ required 20 ml of HCl using phenolphthalein as indicator and 35ml more required if methyl orange is used as indicator . Then molar ratio of $NaHCO_3$ to Na_2CO_3 is

A. $\frac{1}{2}$

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

C. $\frac{3}{4}$

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

Answer: C

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26. A sample of $FeSO_4$ and FeC_2O_4 is dissolved in H_2SO_4 . The complete oxidation of sample required 8/3 eq. of $KMnO_4$. After oxidation , the reaction mixture was reduced by Z. On again oxidation by $KMnO_4$ required $\frac{5}{3}$ eq. The mole ratio of $FeSO_4$ and FeC_2O_4 is

A. $\frac{3}{7}$

B. $\frac{7}{3}$

C. $\frac{5}{7}$

D. $\frac{7}{5}$

Answer: B

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27. The equivalent mass of $MnSO_4$ is half its molecular mass when it is converted to

A. Mn_2O_3

B. MnO

C. MnO_2

D. MnO_4^-

Answer: C

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28. In the titration of $NaHCO_3$ with HCl, indicator cannot be used

A. Methyl orange

B. Methyl red

C. Phenolphthalein

D. All of these

Answer: C

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29. Equivalent weight of Mohr salt in the titration with $KMnO_4$ is (M-Molecular weight)

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

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

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

D. $\frac{M}{2}$

Answer: A

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30. 100 ml of each HCl solution having pH=5 and NaOH having pH=8 is mixture. How much volume of $\frac{N}{100}$ NaOH is required to neutralise to 20 ml of this mixture ?

A. 0.009ml

B. 9 ml

C. 20 ml

D. 15 ml

Answer: A

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31. The volume of 0.1M $AgNO_3$ which is required by 10 ml of 0.09 M K_2CrO_4 to precipitate all the chromate as Ag_2CrO_4 is

A. 9 ml

B. 18 ml

C. 20 ml

D. 36 ml

Answer: B

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32. One litre of a solution contains 15.12 g of HNO_3 and one litre of another solution contains 3.2 g of NaOH. In what volume ratio must these solutions be mixed to obtain a neutral solution ?

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

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

C. $\frac{8}{3}$

D. $\frac{3}{8}$

Answer: A

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Assignment Section C Objective Type Questions More Than One Option Is Correct

1. Regarding the compound CrO_5 which of the following statement is/are correct ?

A. Oxidation number of Cr is (+6)

B. 4-oxygen atoms are present in form of peroxide

C. Oxidation number of Cr is +10

D. 2-oxygen atoms are present in form of peroxide

Answer: A::B

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2. Which of the following can acts as a reducing agent ?

A. H_2S

B. HNO_3

C. $FeSO_4$

D. $SnCl_2$

Answer: A::C::D

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3. Which of the following act both as an oxidising as well as reducing agent ?

A. HNO_3

B. H_2SO_4

C. H_2O_2

D. HNO_2

Answer: C::D

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4. Which of the following statement are correct regarding this equation

$Br_2 \rightarrow BrCO_3^- + Br^-$?

A. Bromine is oxidised

B. Bromine is reduced

C. It is an example of disproportionation reaction

D. Bromine is neither oxidised nor reduced

Answer: A::B::C

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5. Which of the following is/are disproportionation reactions ?

A. $6NaOH + 3Cl_2 \rightarrow NaClO_3 + 5NaCl + 3H_2O$

B. $2NaOH + Cl_2 \rightarrow NaOCl + NaCl + H_2O$

C. $H_2O_2 \rightarrow H_2O + \frac{1}{2}O_2$

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

Answer: A::B::C

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6. Which of the following statements regardign H_2SO_5 is/are correct ?

A. The oxidation number of sulphur is +6

B. Two oxygen atoms are present in form of peroxide

C. Three oxygen atoms are present in form of oxide

D. The oxidation state of sulphur is +8

Answer: A::B::C

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7. Which of the following can act as an oxidising agent ?

A. H_2SO_4

B. HNO_3

C. $KMnO_4$

D. $K_2Cr_2O_7$

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

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8. The oxidation number of carbon is zero in

A. $HCHO$

B. CH_2Cl_2

C. $C_{12}H_{22}O_{11}$

D. $CHCl_3$

Answer: A::B::C

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9. 150 ml $\frac{M}{10}Ba(MnO_4)_2$ in acidic medium can oxidise completely

A. 150 ml 1M Fe^{2+}

B. 50 ml 1M FeC_2O_4

C. 75 ml 1M $C_2O_4^{2-}$

D. 75 ml 1M $K_2Cr_2O_7$

Answer: A::B::C

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10. 20 volume H_2O_2 solution has a strength of about

A. 60.86 g/L

B. 3.58 N

C. 1.79 M

D. $3.035\ \%$

Answer: A::B::C

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11. When 1 mole of $KMnO_4$ is reacted with FeC_2O_4 in acidic medium, then the reacted amount of FeC_2O_4 is

A. $\frac{5}{3}$ moles

B. 5 equivalents

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

D. 3 equivalents

Answer: A::B

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12. For the following balanced redox reaction, $2MnO_4^- + 4H^+ + Br_2 \Leftrightarrow 2Mn^{2+} + 2BrO_3^- + 2H_2O$. If the molecular weight of MnO_4^- and Br_2 are x & y respectively then

A. Equivalent weight of MnO_4^- is $\frac{x}{5}$

B. Equivalent weight of Br_2 is $\frac{y}{5}$

C. Equivalent weight of Br_2 is $\frac{y}{10}$

D. n-factor ratio of MnO_4^- and Br_2 is 2:1

Answer: A::C

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13. Consider the reaction

$aFeS_2 + bO_2 \rightarrow cFe_2O_3 + dSO_2$

Which is correct for the above reaction

A. n-factor for FeS_2 is 11

B. The ratio of moles of a:b is 4:11

C. The ratio of moles of a:b is 11:4

D. The ratio of moles of c:d is 1:4

Answer: A::B::D

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14. When $Na_2S_2O_3$ is reacted with I_2 to form $Na_2S_4O_6$ and Nal then which statement is correct ?

A. n-factor for $Na_2S_2O_3$ is one

B. n-factor for I_2 is two

C. 2 moles of $Na_2S_2O_3$ is reacted with one mole of I_2

D. n-factor for $Na_2S_4O_6$ is one

Answer: A::B::C

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15. Choose the corret statement regarding following reaction

$HNO_2 \rightarrow HNO_3 + NO \uparrow$

A. It is an example of disproportionation reaction

B. Equivalent weight of $HNO_2 = \frac{3M}{2}$

C. Equivalent weight of $HNO_3 = 1M$

D. It is an example of intramolecular redox reaction

Answer: A::B

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16. 31.26 ml of 0.165 M solution of $Ca(OH)_2$ is required to just neutralise 25 ml of citric acid $H_3C_6H_5O_7$. Then correct regarding this is/are

A. n-factor of citric acid is 3

B. Molarity of citric acid is 0.138 M

C. Molarity of citric acid is 0.029 M

D. n-factor of citric acid is 2

Answer: A::B

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17. With 4 mole of KI one mole of Cl_2 is treated to yield gas, which is then treated with hypo solution, then correct regarding this is/are

A. Equivalent weight of I_2 is $\frac{M}{1}$

B. To react completed with product 1 mole of hypo solution are required

C. n-factor of hypo solution is 1

D. n-factor of Cl_2 is 2

Answer: B::C::D

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18. Choose the correct regarding indicator

A.

Titration			Indicator
NaOH	vs	CH_3COOH	Phenolphthalein

B.

Titration			Indicator
$KMnO_2$	vs	FeC_2O_4	$KMnO_4$

C.

Titration			Indicator
I_2	vs	$Na_2S_2O_3$	Starch

D.

Titration			Indicator
$K_2Cr_2O_7$	vs	$FeSO_4$	$K_3\left[Fe(CN)_6\right]$ as external indicator

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

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Assignment Section D Linked Comprehension Type Questions

1. Redox is a reaction in which both oxidation and reduction will take place simultaneously . It is obvious that if one substance gives electron there must be another substance to accept these electrons . In some reactions, same substance is reduced as well as oxidised, these reactions are termed as disproportionation reactions.

For calculating equivalent mass in redox reaction change in oxidtaion number is realted to n-factor which is reciprocal of molar ratio.

This reaction is an example of

$$Br_2 + OH^- \rightarrow BrO_3^- + H_2O + Br^-$$

A. Oxidation reaction only

B. Reduction reaction only

C. Neutralization reaction

D. Disproportionation reaction

Answer: D

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2. Redox is a reaction in which both oxidation and reduction will take place simultaneously . It is obvious that if one substance gives electron there must be another substance to accept these electrons . In some reactions, same substance is reduced as well as oxidised, these reactions are termed as disproportionation reactions.

For calculating equivalent mass in redox reaction change in oxidtaion number is realted to n-factor which is reciprocal of molar ratio.

When P reacts with NaOH, the products are PH_3 and NaH_2PO_2 which of the following statement is correct ?

A. P is oxidised only

B. P is reduced only

C. P is oxidised as well as reduced

D. P is neither reduced nor oxidised

Answer: C

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3. Redox is a reaction in which both oxidation and reduction will take place simultaneously . It is obvious that if one substance gives electron there must be another substance to accept these electrons . In some reactions, same substance is reduced as well

as oxidised, these reactions are termed as disproportionation reactions.

For calculating equivalent mass in redox reaction change in oxidtaion number is realted to n-factor which is reciprocal of molar ratio.

How many moles of $KMnO_4$ are reacted with one mole of ferrous oxalate in acidic medium ?

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

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

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

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

Answer: C

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4. Redox is a reaction in which both oxidation and reduction will take place simultaneously . It is obvious that if one substance gives electron there must be another substance to accept these electrons . In some reactions, same substance is reduced as well as oxidised, these reactions are termed as disproportionation reactions.

For calculating equivalent mass in redox reaction change in oxidtaion number is realted to n-factor which is reciprocal of molar ratio.

The equivalent weight of Cu_2S in the following reaction is

$Cu_2S + O_2 \rightarrow Cu^{+2} + SO_3$

A. $\frac{M.\ wt}{1}$

B. $\frac{M.\ wt}{10}$

C. $\frac{M.\ wt}{8}$

D. $\frac{M.\ wt}{11}$

Answer: B

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5. Redox is a reaction in which both oxidation and reduction will take place simultaneously . It is obvious that if one substance gives electron there must be another substance to accept these electrons . In some reactions, same substance is reduced as well as oxidised, these reactions are termed as disproportionation reactions.

For calculating equivalent mass in redox reaction change in oxidtaion number is realted to n-factor which is reciprocal of molar ratio.

Which of the following is an example of redox reaction ?

A. $2NO_2 \rightarrow N_2O_4$

B. $NH_4OH \rightarrow NH_4^+ + OH^-$

C. $2NO_2 + H_2O \rightarrow HNO_3 + HNO_2$

D. $N_2O_5 + H_2O \rightarrow 2HNO_3$

Answer: C

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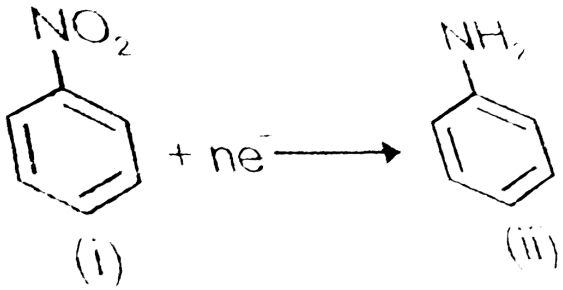
6. Redox is a reaction in which both oxidation and reduction will take place simultaneously . It is obvious that if one substance gives electron there must be another substance to accept these electrons . In some reactions, same substance is reduced as well as oxidised, these reactions are termed as disproportionation reactions.

For calculating equivalent mass in redox reaction change in oxidtaion number is realted to n-factor which is reciprocal of

molar ratio.



For converting one mole of nitrobenzene to aniline how many moles of electrons are transferred ?

A. 2

B. 3

C. 6

D. 8

Answer: C

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7. What is the percentage strength of "15 volume" H_2O_2 ?

A. $6.086\ \%$

B. $4.55\ \%$

C. $3.03\ \%$

D. $1.5\ \%$

Answer: B

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8. 30 g $Ba(MnO_4)_2$ sample containing inert impurity is completely reacting with 100 ml of "28 volume" strength of H_2O_2 in acidic medium then what will be the percentage purity of $Ba(MnO_4)_2$ in the sample ? (Ba=137, Mn=55, O=16)

A. $10\ \%$

B. $40\ \%$

C. $62.5\ \%$

D. $80\ \%$

Answer: C

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9. What volume of H_2O_2 solution of "11.2 volume" strength is required to liberate 2240 ml of O_2 at NTP?

A. 300 ml

B. 500 ml

C. 100 ml

D. 200 ml

Answer: D

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10. 2 g of brass containing Cu and Zn only reacts with 3M HNO_3 solution. Following are the reactions taking place

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

$$Zn(s) + H^+(aq) + NO_3^-(aq) \rightarrow NH_4^+ + Zn^{2+}(aq) + H_2O(l)$$

The liberated $NO_2(g)$ was found to be 1.04 L at 25° C and 1 atm

$[Cu = 63.5, Zn = 65.4]$

The percentage by mass of Cu in brass was

A. $67\ \%$

B. $70\ \%$

C. 80 %

D. 90 %

Answer: A

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11. 2 g of brass containing Cu and Zn only reacts with 3M HNO_3 solution. Following are the reactions taking place

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

$Zn(s) + H^+(aq) + NO_3^-(aq) \rightarrow NH_4^+ + Zn^{2+}(aq) + H_2O(l)$

The liberated $NO_2(g)$ was found to be 1.04 L at 25° C and 1 atm

$[Cu = 63.5, Zn = 65.4]$

The percentage by mass of Cu in brass was

A.

B.

C.

D.

Answer: 67%

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12. 2 g of brass containing Cu and Zn only reacts with 3M HNO_3 solution. Following are the reactions taking place

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

$Zn(s) + H^+(aq) + NO_3^-(aq) \rightarrow NH_4^+ + Zn^{2+}(aq) + H_2O(l)$

The liberated $NO_2(g)$ was found to be 1.04 L at 25° C and 1 atm

$[Cu = 63.5, Zn = 65.4]$

How many grams of NH_4NO_3 will be obtained in the above reaction ?

A. 0.405 g

B. 0.0428 g

C. 0.2018 g

D. 0.358 g

Answer: C

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Assignment Section E Assertion Reason Type Questions

1. STATEMENT-1 $KMnO_4 \xrightarrow{\text{acidic medium}} Mn^{2+}$, n factor of $KMnO_4$ is 5 and

STATEMENT-2 Equivalent mass of $KMnO_4$ in acidic medium is $\frac{M}{5}$ (M=molecular mass of $KMnO_4$)

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 is True

Answer: 1

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2. STATEMENT-1 $H_2O_2 \rightarrow H_2O + \frac{1}{2}O_2$. This is an example of disproportionation reaction.

STATEMENT-2 H_2O_2 can act as a oxidising as well as reducing agent .

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3. The oxidation number of oxygen in OF_2 is

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4. STATEMENT-1 Oxidation state of carbon in its compound is always +4.

STATEMENT-2 : An element can show variable oxidation numbers.

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5. STATEMENT-1: Equivalent mass of $KMnO_4$ in different mediums are different

STATEMENT-2 $KMnO_4$ can act as a oxidising agent .

A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct explanation for Statmenet -1.

B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a correct explanation for Statement -1

C. Statement -1 is True, Statement -2 is False

D. Statement -1 is False, Statmenet -2 is True

Answer: 2

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6. STATEMENT-1: In the reaction : $Cl_2 + OH^- \rightarrow Cl^- + ClO_4^-$ chlorine is oxidised only

STATEMENT-2: Oxidation and reduction cannot take place alone.

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7. STATEMENT-1: The equivalent mass of of $KMnO_4$ in acidic medium is $\frac{M}{5}$ where M=molecular mass of $KMnO_4$

STATEMENT-2: Equivalent mass is equal to product of molecular mass and change in oxidation number.

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8. STATEMENT-1: For the reaction $NaOH + H_2CO_3 \rightarrow NaHCO_3 + H_2O$ equivalent weight of H_2CO_3 is 62.

STATEMENT-2: n factor of H_2CO_3 is 1 (in above reaction) and equivalent mass $= \frac{\text{Molecular mass}}{\text{n factor}}$

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Assignment Section F Matrix Match Type Questions

1. Match Column-I with Column-II

Column-I	Column-II
(A) $CaOCl_2$ (Oxidation state of Cl)	(p) + 6, + 6
(B) $S_2O_3^{2-}$ (Oxidation state of S)	(q) + 1, −1
(C) NH_4NO_3 (Oxidation state of N)	(r) Peroxy linkage is present
(D) H_2SO_5 and $H_2S_2O_8$ (Oxidation state of S)	(s) −3, + 5
(E) $K_2Cr_2O_7$, K_2CrO_4 (Oxidation number of Cr)	(t) −2, + 6

A. A(p) ,B(r) ,C(s) ,D(p,q) ,E(q,r)

B. A(q) ,B(t) ,C(s) ,D(p,r) ,E(p)

C. A(q,r) ,B(p,s) ,C(r,p) ,D(s) ,E(p)

D. A(q,r) ,B(s,t) ,C(s,t,q) ,D(q,r,s) ,E(p)

Answer: B

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2. Match the following

Column-I

(A) $XI_2 + YNO_3^- \longrightarrow IO_3^- + NO_2$ (Acidic med.)

(B) $XClO^- + YCrO_2^- \rightarrow Cl^- + CrO_4^{2-}$ (alkaline)

(C) $XN_2O_4 + YBrO_3^- \rightarrow Br^- + NO_3^-$ (Acidic)

(D) $XAsO_3^{-3} + YMnO_4^- \rightarrow AsO_4^{-3} + MnO_2$ (Acidic)

Column-II

(p) X > Y

(q) X < Y

(r) n-factor (oxidant) > n-factor (Reductant)

(s) n-factor (Reductant) > n-factor (Oxidant)

(t) Oxidant has highest O.N. among the oxidants involved in the reactions

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3. Match the following

Column-I	Column-II (n-factor)
(A) $KMnO_4$ in acidic medium	(p) 10
(B) $Ba(MnO_4)_2$ in acidic medium	(q) 6
(C) $S_2O_3^{-2}$ in alkaline medium	(r) 5
(D) $K_2Cr_2O_7$ in acidic medium	(s) 8

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4. Match the following

Column-	Column-II (n-factor of reactants)
(A) $S_2O_3^{2-}$ in different medium	(p) 8
(B) $KMnO_4$ in different medium	(q) 5
(C) FeC_2O_4 is converted into Fe^{3+} and CO_2	(r) 3
(D) Cu_2S is converted into Cu^{2+} and SO_2	(s) 1

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5. 3.48 g of MnO_2 is added to 500 ml of 0.1 M oxalic acid solution. The resulting solution is then titrated against either 0.02 M $KMnO_4$ or 0.02 M $K_2Cr_2O_7$ solution

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Assignment Section G Interger Answer Type Questions

1. 0.144 g of pure FeC_2O_4 was dissolvedin dilute H_2SO_4 and the solution was diluted to 100 ml . What volume in ml of 0.1 M $KMnO_4$ will be needed to oxidise FeC_2O_4 solution

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2. 2.48 g of $Na_2S_2O_3.\ xH_2O$ is dissolved per litre solution 20 ml of this solution required 10 ml 0.01 M iodine solution. What is value of x ?

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3. $1.245g$ of $CuSO_4.\ xH_2O$ was dissolved in water and H_2S was passed until CuS was completely precipitated. The H_2SO_4

Produced in the filtrated required 10 ml of 1N NaOH solution . X cannot be

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4. In the reaction $VO + Fe_2O_3 \rightarrow FeO + V_2O_5$, the eq.wt. of V_2O_5 is equal to its

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5. 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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6. A 0.1 mole of a metal is burnt in air to form oxide. The same oxide is then reduced by 0.05 M, 4 litres $S_2O_3^{2-}$ (acidic medium) to +3 oxidation state of metal. What is the oxidation state of metal in oxide ?

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7. 100 ml of $Na_2S_2O_3$ solution is divided into two equal two parts A and B . A part requires 12.5 ml of 0.2 M I_2 solution (acidic medium) and part B is diluted x times and 50 ml of diluted solution requires 5 ml of 0.8 M I_2 solution in basic medium. What is value of x ?

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8. For a given reductant , ratio of volumes of 0.2 M $KMnO_4$ and $1M K_2Cr_2O_7$ in acidic medium will be

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Assignment Section H Multiple True False Type Questions

1. STATEMENT-1 $KMnO_4$ acts as powerful oxidising agent in acids, alkaline and neutral medium.

STATEMENT-2: Equivalent weight of $KMnO_4$ in acidic medium in M/5 and in strongly alkaline medium in M/3.

STATEMENT-3 : $KMnO_4$ solution is used as a primary standard and acts as self indicator during its titration more Mohr salt.

A. T F T

B. F T T

C. F F T

D. F F F

Answer: A

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2. STATEMENT-1: In disproportionation reaction 50% of the substance is oxidised and remaining 50% is reduced.

STATEMENT-2: Decomposition of H_2O_2 is not a disproportionation reaction.

STATEMENT-3: Both $HNO_2 \& H_3PO_3$ can undergo disproportionation reaction.

A. T T T

B. F F T

C. F F F

D. T F T

Answer: B

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3. STATEMENT-1: In the reaction $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$. Cu^{2+} ions act as oxidising agent and Zn atoms act as a reducing agent.

STATEMENT-2: Every redox reaction cannot be splitted into two reactions one being oxidation and the other being reductioin.

STATEMENT-3: The oxidation numbers are artifical and are useful as a book keeping device of electrons in reactions.

A. T T T

B. F F T

C. F F F

D. T F T

Answer: D

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4. STATEMENT-1: N/10, 100 ml $KMnO_4$ solution is sufficient to oxidise M/10, 50 ml FeC_2O_4 solution in acidic medium.

STATEMENT-2: The left solution of statement -1 is sufficient to react with 8.33 ml of M/10 $K_2Cr_2O_7$ solution in acidic medium.

STATEMENT-3: 1.06 g Na_2CO_3 will require 100 ml of 0.1 M HCl solution with phenolphthalein.

A. F T T

B. F T F

C. T F T

D. T T F

Answer: A

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5. STATEMENT-1: Volume required for 0.1 M solution is in order $V_{KMnO_4} < V_{K_2Cr_2O_7} < V_{H_2O_2}$

STATEMENT-2: The number of equivalents required will be in order $H_2O_2 > KMnO_4 > K_2Cr_2O_7$

STATEMENT-3: The n_{factor} is in order $n_{H_2O_2} < n_{KMnO_4} < n_{K_2Cr_2O_7}$

A. T T F

B. T F T

C. F F T

D. F T F

Answer: C

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Assignment Section I Subjective Type Questions

1. Determine the oxidation number of the element as indicated

(i) P in NaH_2PO_4

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2. Oxidarion number of Mn in K_2MnO_4 is

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3. Determine the oxidation number of the element as indicated

(iii) I in KIO_3

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4. What is the oxidation number of iodine in Kl_3?

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5. Oxidation number of Fe in Fe_3O_4 are:

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6. Determine the oxidation number of the element as indicated

(vi) C in CH_3OH

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7. The oxidation number of S in $Na_2S_4O_6$ is

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8. Determine the oxidation number of the element as indicated

(viii) Cr in CrO_2Cl_2

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9. Determine the oxidation number of the element as indicated

(ix) Cr in $\left[Cr(NH_3)_6\right]Cl_3$

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10. The oxidation number of Fe in $K_4[Fe(CN))(6)]$ is

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11. Balance the chemical equation by the oxidation number method.

(i) $CuO + NH_3 \rightarrow Cu + N_2 + H_2O$

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12. Balance the chemical equation by the oxidation number method.

(ii) $P + HNO_3 \rightarrow HPO_3 + NO + H_2O$

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13. Balance the chemical equation by the oxidation number method.

(iii) $FeS_2 + O_2 \rightarrow Fe_2O_3 + SO_2$

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14. Balance the chemical equation by the oxidation number method.

(iv) $Zn + HNO_3 + Zn(NO_3)_2 + N_2O + H_2O$

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15. Balance the chemical equation by the oxidation number method.

(v) $SnO_2 + C \rightarrow Sn + CO$

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16. Balance the chemical equation by the oxidation number method.

(vi) $FeCl_3 + H_2S \rightarrow FeCl_2 + S + HCl$

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17. Balance the chemical equation by the oxidation number method.

(vii) $H_2O_2 + PbS \rightarrow PbSO_4 + H_2O$

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18. Balance the chemical equation by the oxidation number method.

(viii) $MnO_2 + HCl \rightarrow MnCl_2 + Cl_2 + H_2O$

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19. Balance the chemical equation by the oxidation number method.

(ix) $I_2 + HNO_3 \rightarrow HIO_3 + NO_2 + H_2O$

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20. Balance the following equation by oxidation number method

$K_2Cr_2O_7 + HCl \rightarrow KCl + CrCl_3 + H_2O + Cl_2$

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21. Balance the following reaction by the oxidation number method -

$MnO_4^- + Fe^{+2} \rightarrow Mn^{+2} + Fe^{+3}$

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22. Balance the equation by lon-electron method

(ii) $MnO_4^- + H_2C_2O_4 \rightarrow Mn^{2+} + CO_2$ (In acidic medium)

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23. Balance the equation by lon-electron method

(iii) $Cu^{2+} + SO_2 \rightarrow SO_4^{2-} + Cu^{+}$ (In acidic medium)

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24. Balance the equation by lon-electron method

(iv) $N_2O_4 + BrO_3^- \rightarrow NO_3^- + Br^-$ (In acidic medium)

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25. Balance the equation by lon-electron method

(v) $Br^- + BrO_3^- \rightarrow Br_2$ (In acidic medium)

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26. Balance the equation by lon-electron method

(vi) $Cl_2 + OH^- \rightarrow S^{2-} + S_2O_3^{2-}$ (In basic medium)

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27. Balance the equation by lon-electron method

(vii) $S + OH^+ \rightarrow S^{2-} + S_2O_3^{2-}$ (In basic medium)

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28. Balance the equation by lon-electron method

(viii) $Al + NO_3^- \rightarrow Al(OH)_4^- + NH_3$ (In basic medium)

Watch Video Solution

29. Balance the equation by lon-electron method

(ix) $Cr_2O_7^{2-} + Fe^{2+} \rightarrow Fe^{3+} + Cr^{3+}$ (In acidic medium)

Watch Video Solution

30. Balance the equation by lon-electron method

(x) $Fe_3O_4 + MnO_4^- \rightarrow Fe_2O_3 + MnO_2$ (In basic medium)

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31. 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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32. 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:

$$MnO_2 + 4\text{HCl} \rightarrow MnCl_2 + 2H_2O + Cl_2$$

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33. 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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34. $5.7g$ 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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35. Borax in water gives

$$B_4O_7^{2-} + 7H_2O \rightarrow 4H_3BO_3 + 2OH^-$$

How many grams of Borax $(Na_2B_4O_7.10H_2O)$ are required to prepare 50 ml of 0.2 M solution.

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36. $1g$ 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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37. A solution contains Na_2CO_3 and $NaHCO_3$. $10mL$ of the solution required $2.5mLof0.1MH_2SO_4$ for neutralisation using phenolphthalein as indicator. Methyl orange is then added when a further $2.5mLof0.2MH_2SO_4$was required. The amount of Na_2CO_3 and $NaHCO_3$ in $1litre$ of the solution is:

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38. 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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Assignment Section J Aakash Challengers Questions

1. During the oxidation of arsenite to arsenate ion in alkaline medium, the number of moles of hydroxide ions involved per

mole of arsenite ion are

A. 2

B. 3

C. $2/3$

D. $3/2$

Answer: A

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2. When copper is treated with a certain concentration of nitric acid, nitric oxide and nitrogen dioxide are liberated in equal volumes according to the equation

$$xCu + yHNO_3 \rightarrow Cu(NO_3)_2 + NO + NO_2 + H_2O$$

The coefficients x and y are

A. 2 and 6

B. 4 and 12

C. 1 and 3

D. 3 and 8

Answer: B

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3. $IO_3^- + I^- + H^+ \rightarrow$

A. 5,1,6

B. 1,5,6

C. 6,1,5

D. 5,6,1

Answer: A

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4. Which one of the following compounds does not decolourise an acidified aqueous solution of $KMnO_4$

A. $FeCl_3$

B. $FeSO_4$

C. SO_2

D. H_2O_2

Answer: A

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5. 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. $6/5$

B. $3/5$

C. $2/5$

D. $1/3$

Answer: A

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6. The oxidation number of sulphur in S_8, S_2F_2 and H_2S respectively are:

A. $0, +1$ and -2

B. $0, +2$ and -2

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

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

Answer: A

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7. $Cr(OH)_3 + ClO^- + 3OH^- \rightarrow ? + Cl^- 3H_2O.$ The missing ion is

A. $Cr_2O_7^{2-}$

B. Cr^{3+}

C. CrO_4^{2-}

D. Cr_2O_3

Answer: C

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8. The chromate ion present in water sample is reduced to insoluble chromium hydroxide , $Cr(OH)_3$ by dithionation, in basic solution .

$$S_2O_4^{2-} + CrO_4^{2-} + 2H_2O \rightarrow 2SO_3^{2-} + Cr(OH)_3 + OH^-$$

100 L of water requires 387 g of $Na_2S_2O_4$. The molarity of CrO_4^{2-} in waste water is

A. 0.0448

B. 4.448

C. 0.0148

D. 0.0224

Answer: C

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9. A sample which conains exactly 0.5 g of uranium in the form of U^{4+} . The total uranium is allowed to oxidized by 50 ml of $KMnO_4$. The reaction taking place is

$$U^{4+} + KMnO_4 + H_2O \rightarrow UO_2^{2+} + Mn^{2+} + H_2O^+$$

Find the concentration of $KMnO_4$ required for the above purpose [U=238]

A. 0.0336 M

B. 0.0084 M

C. 0.0168 M

D. 0.0672 M

Answer: C

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10. A 50 ml of 20% (w/w) solution of density 1.2 g/ml is diluted until is strength becomes 6% (w/w) . Determine the mass of water added.

A. 88 g

B. 120 g

C. 140 g

D. 180g

Answer: C

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11. 1.245 g of $CuSO_4.xH_2O$ was dissolved in water and H_2S gas was passed through it will till CuS was completely precipitated . The H_2SO_4 produced in the filtrate required 100 ml of 0.1 M NaOH solution . Calculate x (approximately)

A. 5

B. 6

C. 7

D. 8

Answer: C

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Exercise

1. Oxidation state of nitrogen in $H - N \equiv C$ is

A. -4

B. $+3$

C. -3

D. -2

Answer: C

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2. Oxidation state of oxygen in CrO_5 is

A. -1

B. -2

C. Both (1) & (2)

D. $-\frac{1}{2}$

Answer: C

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3. The number of peroxide linkages in CrO_5 and H_2SO_5 respectively are

A. 1, 1

B. 2, 0

C. 2, 1

D. 1, 2

Answer: C

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4. The pair of the compounds in which both the metals are in the highest possible oxidation state is

A. $FeSO_4, CuS_2$

B. CrO_2Cl_2, MnO_4^-

C. TiO_2, MnO_2

D. $\left[Co(CN)_6\right]^{3-}, MnO_3$

Answer: B

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5. Oxidation number of chlorine atoms in $CaOCl_2$ are

A. 0, 0

B. $-1, \ -1$

C. $-1, \ +1$

D. $-2, \ +7$

Answer: C

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6. When ethane is burnt in excess of oxygen,, the oxidation number of carbon changes by

A. $+8$

B. $+7$

C. $+3$

D. $+4$

Answer: B

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7. The oxidation state of oxygen in the following reaction changes, $K + O_2 \rightarrow KO_2$

A. From $0 \rightarrow -1$

B. From $0 \rightarrow -2$

C. From $0 \rightarrow -\frac{1}{2}$

D. From $0 \rightarrow +1$

Answer: C

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8. The number of electrons involved when 1 mole of H_2O_2 decomposes as

$H_2O_2 \rightarrow H_2O + O_2$, is

A. 1

B. 8

C. 6

D. 4

Answer: A

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9. Which of the following elements never show positive oxidation number?

A. O

B. Fe

C. Ga

D. F

Answer: D

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10. When SO_2 is passed in acidified $K_2Cr_2O_7$ solution oxidation state of S changed from

A. $+4$ to 0

B. $+4 \text{ to } +2$

C. $+4 \text{ to } +6$

D. $+6 \text{ to } +4$

Answer: C

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11. In an electrochemical cell, the flow of electrons is from

A. Anode to cathode through internal circuit

B. Cathode to anode through external circuit

C. Cathode to anode through internal circuit

D. Anode to cathode through external circuit

Answer: D

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12. In SHE, the pH of the acid solution

A. 7

B. 14

C. 0

D. 4

Answer: C

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13. An electrochemical cell has two half cell reaction as,

$A^{2+} + 2e^-, E^0 = 0.34V$

$X \to X^{2+} + 2e^-, E^0 = +2.37V$. The cell voltage will be

A. 2.71 V

B. 2.03 V

C. $-2.71V$

D. $-2.03V$

Answer: A

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14. Which of the following is the most reactive metal?

A. K

B. Zn

C. Ni

D. Ag

Answer: A

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15. Which of the following element has maximum standard reduction potential?

A. Li

B. K

C. F

D. Cl

Answer: C

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16. Choose the correct statement for galvanic cell

A. Oxidation : cathode

B. Positive electrode : cathode

C. Flow of electron : cathode to anode

D. All are correct

Answer: B

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17. Which of the following involves redox reaction?

A. Decomposition of $CaCO_3$

B. Rusting

C. Reaction of NaOH with HCl

D. $Zn \rightarrow Zn^{++} + 2e^-$

Answer: B

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18. Which of the following is true about salt bridge?

A. It maintains the neutrality

B. It completes the circuit

C. It contains salt

D. All are correct

Answer: D

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19. Standard reduction potential is calculated at

A. $27^\circ C$

B. $25^\circ C$

C. $0^\circ C$

D. $100^\circ C$

Answer: B

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20. The electrochemical cell representing the given reaction

$$Ni(s) + Cu^{2+} \rightarrow Ni^{2+} + Cu(s)$$

A. $Ni(s)\left|Cu^{2+}\right|\left|Ni^{2+}\right|Cu(s)$

B. $Ni(s)\left|Ni^{2+}\right|\left|Cu^{2+}\right|Cu$

C. $Cu(s)\left|Cu^{2+}\right|\left|Ni(s)\right|Ni^{2+}$

D. $Cu(s)\left|Cu^{2+}\right|\left|Ni^{2+}\right|Ni(s)$

Answer: B

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Assignment Section A

1. The process in which oxidation number increase, is

A. Reduction

B. Hydrolysis

C. Oxidation

D. Decomposition

Answer: C

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2. The oxidation state of phosphorus vary from

A. $-3 \text{ to } +5$

B. $-1 \text{ to } +1$

C. $-3 \text{ to } +3$

D. $-5 \text{ to } +1$

Answer: A

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3. Oxidation number of iodine varies from -

A. $-1 \text{ to } +1$

B. $-1 \text{ to } +7$

C. $+3 \text{ to } +5$

D. $-1 \text{ to } +5$

Answer: B

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

A. Oxidation

B. Reduction

C. Disproportionation

D. Neutralization

Answer: C

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5. Oxidation number of oxygen atom in O_3 molecule is

A. 0

B. -2

C. $+2$

D. $-1/2$

Answer: A

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6. The oxidation number, of C in $CH_4. CH_3CI, CH_2CI_2, CHCl_3$ and CCl_4 are respectively:

A. $-4, \ -2, 0, \ +2, \ +4$

B. $+2, 4, 0, \ -2, \ -4$

C. $4, 2, 0, \ -2, 4$

D. $0, 2, \ -2, 4, 4$

Answer: A

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7. Chlorine is in $+3$ oxidation state in

A. HCl

B. $HClO_4$

C. lCl

D. ClF_3

Answer: D

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8. Given that the oxidation number of sulphur is -2, the equivalent weight of sulphur is

A. 16

B. 32

C. 9

D. 4

Answer: A

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9. In a reaction between zinc and Iodine, zinc iodide is formed. Which is being oxidised?

A. Zinc ions

B. Iodide ions

C. Zinc atom

D. Iodine

Answer: C

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10. In the reaction

$$3Br_2 + 6CO_3^{2-} + 3H_2O \rightarrow 5Br^{\ominus} + BrO_3^{\ominus} + 6HCO_3^{\ominus}$$

A. Bromine is oxidised and carbonate is reduced

B. Bromine is reduced and carbonate is oxidised

C. Bromine is neither reduced nor oxidised

D. Bromine is reduced as well oxidised

Answer: D

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11. In which reaction, there is change in oxidation number of N atom?

A. $2NO_2 \Leftrightarrow N_2O_4$

B. $2NO_2 + H_2O \rightarrow HNO_3 + HNO_2$

C. $NH_4OH \rightarrow NH_4^+ + OH^-$

D. $N_2O_5 + H_2O \rightarrow 2HNO_3$

Answer: B

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12. When zinc is added to $CuSO_4$ solution, copper is precipitated. It is because of

A. Oxidation of Cu^{+2}

B. Reduction of Cu^{+2}

C. Hydrolysis of $CuSO_4$

D. Ionization of $CuSO_4$

Answer: B

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13. Which of the following reactions involve oxidation and reduction?

A. $NaBr + HCl \rightarrow NaCl + HBr$

B. $HBr + AgNO_3 \rightarrow AgBr + HNO_3$

C. $H_2 + Br_2 \rightarrow 2HBr$

D. $Na_2O + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

Answer: C

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14. Which of the following involves the reduction of copper?

A. $Cu(s) + 1/2O_2(g) \rightarrow CuO(s)$

B. $Cu^{2+}(aq) + 2l^{-}(aq) \rightarrow 2C\text{ul}(aq)$

C. $CuCl_2(s) + 2F^{-}(aq) \rightarrow CuF_2 + Cl_2(g)$

D. $CuO + H_2O \rightarrow Cu(OH)_2$

Answer: B

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15. Which one of the following is the correct match?

A. Cl_2 – only reducing agent

B. HNO_2 – only oxidising agent

C. HNO_3 – both oxidising and reducing agent

D. SO_2 – both oxidising and reducing agent

Answer: D

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

A. $+7$

B. $+6$

C. -6

D. $+4$

Answer: B

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17. In which of the following compounds iron has lowest oxidation number?

A. $FeSO_4.(NH_4)_2SO_4.6H_2O$

B. $K_4[Fe(CN)_6]$

C. Fe_2O

D. Fe_2O_3

Answer: C

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18. Phosphorus has the oxidation state $+3$ in

A. Orthophosphoric acid (H_3PO_4)

B. Phosphorus acid (H_3PO_3)

C. Metaphosphoric acid (HPO_3)

D. Pyrophosphoric acid $(H_4P_2O_7)$

Answer: B

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19. The brown ring complex compound is formulated as $\left[Fe(H_2O)_5NO\right]SO_4$. The oxidation state of Fe is

A. $+1$

B. $+2$

C. $+3$

D. $+6$

Answer: A

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20. Oxidation number of Cr in CrO_5 is

A. $+10$

B. $+6$

C. $+4$

D. $+5$

Answer: B

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21. In which of the following compounds , the oxidation number of iodine is fractional ?

A. IF_7

B. I_3^-

C. IF_5

D. IF_3

Answer: B

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22. Which reaction involves neither oxidation nor reduction?

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

B. $Cr \rightarrow CrCl_3$

C. $KMnO_4 \rightarrow MnO_2$

D. $Fe \rightarrow Fe_2O_3 \cdot xH_2O$

Answer: A

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23. In the chemical reaction,

$$K_2Cr_2O_7 + aH_2SO_4 + bSO_2 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + CH_2O.$$

a, b and c are

A. 1, 3, 1

B. 4, 1, 4

C. 3, 2, 3

D. 2, 1, 2

Answer: A

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24. What is the oxidation state of sodium in sodium amalgam (Na/Hg)?

A. $+1$

B. 0

C. -1

D. $+2$

Answer: B

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25. Which of the following compound cannot be oxidised by O_3?

A. Kl

B. $KMnO_4$

C. K_2MnO_4

D. $FeSO_4$

Answer: B

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26. In alkaline medium , $KMnO_4$ reacts as follows

$2KMnO_4 + 2KOH \rightarrow 2K_2MnO_4 + H_2O + O$

Therefore, the equivalent mass of $KMnO_4$ will be

A. 31.6

B. 52.7

C. 79.0

D. 158.0

Answer: D

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27. The equivalent weight of FeS_2 in the following reaction is

$FeS_2 + O_2 \rightarrow Fe^{+3} + SO_2$

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

B. $\frac{\text{Mol. wt}}{7}$

C. $\frac{\text{Mol. wt}}{11}$

D. $\frac{\text{Mol. wt}}{9}$

Answer: C

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28. When SO_2 is passed in acidified potassium dichromate solution, the oxidation number of S is changed from

A. $+4$ to zero

B. $+4 \text{ to } +2$

C. $+4 \text{ to } +6$

D. $+6 \text{ to } +4$

Answer: C

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29. How many mole of $FeSO_4$ reacted with one mole of $KMnO_4$ in acidic medium?

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

B. 5

C. $\frac{1}{2}$

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

Answer: B

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30. A compound of Xe and F is found to have 53.3% Xe (atomic weight = 133) Oxidation number of Xe in this compound is

A. $+2$

B. 0

C. $+4$

D. $+6$

Answer: D

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31. Which of the following is not correct for electrochemical cell?

A. Convert chemical energy to electrical energy

B. Anode is -ve terminal

C. Cathode is -ve terminal

D. Cathode is +ve terminal

Answer: C

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32. Which of the following is not a redox reaction?

A. $H_2 + Cl_2 \rightarrow 2HCl$

B. $NaOH + HCl \rightarrow NaCl + H_2O$

C. Photosynthesis

D. Cell respiration

Answer: B

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33. Redox reaction have no concern with

A. Neutrailization of acid bases

B. Salt hydrolysis

C. Esterification

D. All of these

Answer: D

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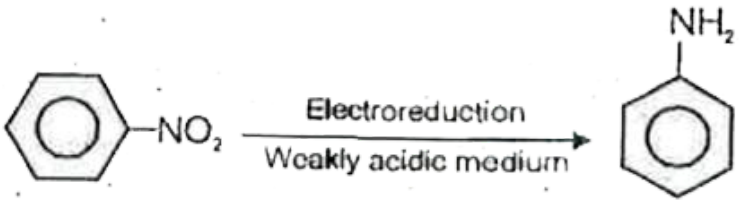
34. 

n factor of nitrobenzene in this process

A. 3

B. 6

C. 2

D. 4

Answer: B

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35. In this process of photosynthesis, which takes place in green plants which undergoes reduction?

A. Water

B. CO_2

C. Protons

D. Photons

Answer: B

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Assignment Section B

1. The ratio of number of moles of $KMnO_4$ and $K_2Cr_2O_7$ required to oxidise 0.1 mol Sn^{2+} to Sn^{+4} in acidic medium

A. $6:5$

B. $5:6$

C. $1:2$

D. $2:1$

Answer: A

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2. $Cl_2 \xrightarrow{NaOH} NaCl + NaClO_3 + H_2O$

The equivalent mass of Cl_2 in the above reaction is

A. M

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

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

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

Answer: D

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3. KCl is used in salt bridge because:

A. K^+ and Cl^- are isoelectronic

B. Monovalent ions are required

C. Both the ions have almost same velocity

D. They are having similar size

Answer: C

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4. EMF of the given cell

$$A_{(s)}\left|A^{2+}_{(aq)}\right|\left|B^{2+}_{(aq)}\right|B_s$$

Given $E^{\circ}_{A/A^{2+}}: +1.4V$ and $E^{\circ}_{B/B^{2+}}: -1.4V.$

A. 2.8 V

B. 1.8 V

C. 0 V

D. -1.8 V

Answer: A

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5. Electrode potential depends upon

A. Size of electrode

B. Surface area of electrode

C. Temperature

D. Shape of electrode

Answer: C

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6. Oxidation number of Cr atom in CrO_5 and K_3CrO_8 respectively

A. $+6,\ +6$

B. $+5,\ +6$

C. $+6,\ +5$

D. $+5,\ +5$

Answer: C

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7. Number of electrons involved in the reaction when 0.1 mol NH_3 dissolved in water

A. 2

B. 0.4

C. 0.9

D. Zero

Answer: D

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8. $\frac{1}{2}F_2 + e^- \rightarrow F^- \quad E^\circ = +3.02V$

Electrode potential for given reaction

$F_2 + 2e^- \rightarrow 2F^-$

A. 3.02 V

B. 6.04 V

C. 1.5 V

D. -3.02 V

Answer: A

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9. Three metals A, B and C are arranged in increasing order of standard reduction electrode potential, hence their chemical reactivity order will be

A. $A < B < C$

B. $A > B > C$

C. $B > C > A$

D. $A = B = C$

Answer: B

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10. Find the incorrect statement

A. Higher reduction potential of non-metal means stronger reducing agent

B. Lower oxidation potential of a metal means strong oxidising agent

C. Oxidation state of oxygen in O_3 is -1

D. All of these

Answer: D

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11. When an alkali metal is reacted with hydrogen then metallic hydride is formed. In this reaction

A. Hydrogen is oxidised

B. Hydrogen is reduced

C. Hydrogen is neither oxidised nor reduced

D. Hydrogen is oxidised as well as reduced

Answer: B

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12. In case of CH_3COOH, the oxidation number of carbon of carboxylic group is

A. -3

B. Zero

C. $+1$

D. $+3$

Answer: D

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13. How many moles of $KMnO_4$ are required to oxidise one mole of $SnCl_2$ in acidic medium?

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

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

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

D. $\frac{4}{5}$

Answer: B

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14. Which compound acts as oxidising agent only?

A. SO_2

B. H_2S

C. H_2SO_4

D. HNO_2

Answer: C

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15. The average oxidation state of chlorine in bleaching powder is

A. -1

B. $+1$

C. Zero

D. $-2 \quad \text{as well as} \quad +2$

Answer: C

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16. When benzaldehyde is oxidised to give benzoic acid then the oxidation state of carbon of aldehydic group is changed from

A. $+2 \quad \text{to} \quad +3$

B. $+1$ to $+3$

C. Zero to +2

D. No change

Answer: B

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17. Which of the following is incorrect regarding salt bridge solution ?

A. Solution must be a strong electrolyte

B. Solution should be inert towards both electrodes

C. Size of cations and anions of salt should be much different

D. Salt bridge solution is prepared in gelatin or agar-agar to make it semi-solid

Answer: C

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18. Standard electrode potentials of redox couples $A^{2+}/A, B^{2+}/B, C/C^{2+}$ and D^{2+}/D are 0.3 V, -0.5 V, -0.75 V and 0.9 V respectively. Which of these is best oxidising agent and reducing agent respectively?

A. D^{2+}/D and B^{2+}/B

B. B^{2+}/B and D^{2+}/D

C. D^{2+}/D and C^{2+}/C

D. C^{2+}/C and D^{2+}/D

Answer: A

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19. The number of moles of H_2O_2 required to completely react with 400 ml of 0.5 N $KMnO_4$ in acidic medium are

A. 0.1

B. 0.2

C. 1.0

D. 0.5

Answer: A

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20. $Cl_2(g) + X\overline{O}H \rightarrow YClO_3^- + ZH_2O + 10e^-$

The coefficient X, Y and Z are

A. 6, 2, 2

B. 5, 1, 3

C. 12, 2, 6

D. 12, 1, 6

Answer: C

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Assignment Section C

1. Assuming complete ionization, same moles of which of the following compounds will require the least amount of acidified $KMnO_4$ for complete oxidation ?

A. FeC_2O_4

B. $Fe(NO_2)_2$

C. $FeSO_4$

D. $FeSO_3$

Answer: C

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2. Which of the following processes does not involve oxidation of iron ?

A. Liberation of H_2 from steam by ironn at high temperature

B. Rusting of iron sheets

C. Decolourization of blue $CuSO_4$ solution by iron

D. Formation of $Fe(CO)_5$ from Fe

Answer: D

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3. (a) $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$

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

Role of hydrogen peroxide in the above reactions is respectively

A. Oxidizing in (a) and reducing in (b)

B. Reducing in (a) and oxidizing in (b)

C. Reducing in (a) and (b)

D. Oxidizing in (a) and (b)

Answer: C

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4. In which of the following compounds, nitrogen exhibits highest oxidation state?

A. N_3H

B. NH_2OH

C. N_2H_4

D. NH_3

Answer: A

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5. A solution contains Fe^{2+}, Fe^{3+} and T^{-} ions. This solution was treated with iodine at $35^{\circ}C$. E° for Fe^{3+}, Fe^{2+} is $0.77V$ and E° for $I_2/2I^{-}$ = 0.536 V. The favourable redox reaction is:

A. I^{-} will be oxidised to I_2

B. Fe^{2+} will be oxidised to Fe^{3+}

C. I_2 will be reduced to I^{-}

D. There will be no redox reaction

Answer: A

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6. Oxidation state of P in $H_4P_2O_5, H_4P_2O_6, H_4P_2O_7$ are respectively

A. $+3,\ +5,\ +4$

B. $+5,\ +3,\ +4$

C. $+5,\ +4,\ +3$

D. $+3,\ +4,\ +5$

Answer: D

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7. Oxidation number of P in PO_4^{3-}, of S in SO_4^{2-} and that of $Cr_2O_7^{2-}$ are respectively

A. $+3,\ +6\ \text{and}\ +5$

B. $+5,\ +3\ \text{and}\ +6$

C. $-3,\ +6\ \text{and}\ +6$

D. $+5, \ +6 \ \text{and} \ \ +6$

Answer: D

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8. The number of moles of $KMnO_4$ that will be needed to react with one mole of sulphite ion in acidic solution is

A. 1

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

C. $\frac{4}{5}$

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

Answer: D

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9. Standard reduction potentials of the half reactions are given below

$$F_{2(g)} + 2e^- \rightarrow 2F^-_{(aq)} \quad E^\circ = +2.85V$$
$$Cl_{2(g)} + 2e^- \rightarrow 2Cl^-_{(aq)} \quad E^\circ = +1.36V$$
$$Br_{2(l)} + 2e^- \rightarrow 2Br^-_{(aq)} \quad E^\circ = +1.06V$$
$$l_{2(s)} + 2e^- \rightarrow 2l^-_{(aq)} \quad E^\circ = +0.53V$$

The strongest oxidising and reducing agents respectively are

A. F_2 and l^-

B. Br_2 and Cl^-

C. Cl_2 and Br^-

D. Cl_2 and l_2

Answer: A

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10. Standard electrode potential for Sn^{4+}/Sn^{2+} couple is $0.15V$ and that for the Cr^{3+}/Cr couple is $-0.74V$. These two couples in their standard state are connected to make a cell. The cell potential will be

A. $+1.83V$

B. $+1.19V$

C. $+0.89V$

D. $+0.18V$

Answer: C

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11. Standard electrode potential of three metal X, Y and Z are $-1.2V, +0.5V$ and $-3.0V$ respectively. The reducing power of

these metals will be:

A. $X > Y > Z$

B. $Y > Z > X$

C. $Y > X > Z$

D. $Z > X > Y$

Answer: D

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12. In the reaction

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

A. Oxygen is oxidised only

B. Oxygen is reduced only

C. Oxygen is neither oxidised nor reduced

D. Oxygen is both oxidised and reduced

Answer: D

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13. Which change requires an oxidising agent?

A. $2S_2O_3^{2-} \Leftrightarrow S_4O_6^{2-}$

B. $Zn^{2+} \Leftrightarrow Zn$

C. $ClO^- \Leftrightarrow Cl^-$

D. $SO_3 \Leftrightarrow SO_4^{2-}$

Answer: A

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14. Given the following reaction involving A,B,C and D

(i) $C + B^+ \rightarrow C^+ + B$

(ii) $A^- + D \rightarrow$ NO reaction

(iii) $C^+ + A \rightarrow$ NO reaction

(iv) $D + B^+ \rightarrow D^+ + B$

the correct arrangement of A,B,C,D in the order of their decreasing ability as reducing agent

A. $D > B > C > A$

B. $A > C > D > B$

C. $C > A > B > D$

D. $C > A > D > B$

Answer: D

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15. Which element undergoes disproportionation in water ?

A. Cl_2

B. F_2

C. K

D. Cs

Answer: A

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16. Standard reducation potential at $25^\circ C$ of Li^+ / Li, Ba^{2+} / Ba, Na^+ / Na and Mg^+ / Mg are -3.05, -2.90, -2.71 and -2.37 volt respectively. Which one of the following is the strongest oxidising agent ?

A. Ba^{2+}

B. Mg^{2+}

C. Na^{+}

D. Li^{+}

Answer: B

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17. Which substance is serving as a reducing agent in the following reaction?

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

A. H^{+}

B. $Cr_2O_7{}^{2-}$

C. H_2O

D. Ni

Answer: D

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18. The oxidant which cannot act as a reducing agent is

A. CO_2

B. ClO_2

C. NO_2

D. SO_2

Answer: A

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19. The oxidation state of Fe in Fe_3O_4 is :

A. $\frac{5}{4}$

B. $\frac{4}{5}$

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

D. $\frac{8}{3}$

Answer: D

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20. Oxidation numbers of A, B, C are +2, +5 and -2 respectively. Possible formula of compound is

A. $A_2(BC_2)_2$

B. $A_3(BC_4)_2$

C. $A_2(BC_3)_2$

D. $A_3(B_2C_2)$

Answer: B

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21. The oxidation states of sulphur in the anions SO_3^{2-}, $S_2O_4^{2-}$, and $S_2O_6^{2-}$ follow the order

A. ${S_2O_4}^{2-} < {SO_3}^{2-} < {S_2O_6}^{2-}$

B. ${SO_3}^{2-} < {S_2O_4}^{2-} < {S_2O_6}^{2-}$

C. ${S_2O_4}^{2-} < {S_2O_6}^{2-} < {SO_3}^{2-}$

D. ${S_2O_6}^{2-} > {S_2O_4}^{2-} < {SO_3}^{2-}$

Answer: A

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22. Electrode potential for the following half-cell reactions are

$Zn \rightarrow Zn^{2+} + 2e^{-}, E^{\circ} = +0.76V,$

$Fe \rightarrow Fe^{2+} + 2e^{-}, E^{\circ} = +0.44V$

The EMF for the cell reaction $Fe^{2+} + Zn \rightarrow Zn^{2+} + Fe$ will be

A. $-0.32V$

B. $+1.20V$

C. $-1.20V$

D. $+0.32V$

Answer: D

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23. In acidic medium, H_2O_2 changes $Cr_2O_7^{2-}$ to CrO_5 which has two (-O-O-) bonds. Oxidation state of Cr in CrO_5 is

A. $+5$

B. $+3$

C. $+6$

D. -10

Answer: C

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Assignment Section D

1. A : Fluorine acts as a stronger oxidising agent than chlorine.

R : Standard reduction potential of fluorine is higher than Cl_2

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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2. A : Oxidation number of carbon in HCN is +4.

R : Oxidation state and valency is same for carbon.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: D

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3. A : Equivalent weight of $KMnO_4$ in acidic medium is $\frac{M}{5}$.

R : In acidic medium 1 mol of MnO_4^- gains 5 electron.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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4. A : Electrons flow in external circuit of galvanoic cell while ions flow in internal circuit.

R : Direction of current flow is reverse that of electron flow.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: B

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5. A : Sn^{2+} and Fe^{3+} can't remain together in a solution.

R : Sn^{2+} and Fe^{3+} will react mutually to form Sn^{4+} and Fe^{2+}.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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6. A : The oxidation number of S is +6 in H_2SO_4.

R : H_2SO_4 has one peroxide linkage.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: C

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7. A : HNO_2 acts as reducing agent only.

R : HNO_2 oxidises to HNO_3 only but not reduce by any reducing agent.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: D

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8. A : In alkaline medium, $KMnO_4$ acts as powerful oxidising agent.

R : $KMnO_4$ reduces to give Mn^{2+} in alkaline medium.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: C

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9. A : When Cu_2S is converted into Cu^{++} & SO_2, then equivalent weight of Cu_2S will be M/8 (M = Mol. wt. of Cu_2S)

R : Cu^{+} is converted Cu^{++}, during this one electrons is lost.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: B

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10. A : I_2 is a mild oxidising agent.

R : I_2 can be used for titrating sodium thiosulphate.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: B

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