Q1 - 2024 (01 Feb Shift 1)

In acidic medium, $K_2Cr_2O_7$ shows oxidising action as represented in the half reaction

$Cr_2O_7^{2-} + XH^+ + Ye^- \rightarrow 2\ A + ZH_2O$

X, Y, Z and A are respectively are:

(1) 8, 6, 4 and Cr_2O_3

(2) 14, 7, 6 and Cr^{3+}

(3) 8, 4, 6 and Cr_2O_3

(4) 14, 6, 7 and Cr^{3+}

Q2 - 2024 (01 Feb Shift 1)

Which of the following reactions are disproportionation reactions?

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

(B) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

(C) $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$

(D) $2MnO_4^- + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^+$

Choose the correct answer from the options given below:

(1) (A), (B)

(2) (B), (C), (D)

(3) (A), (B), (C)

(4) (A), (D)

Q3 - 2024 (01 Feb Shift 1)

Given below are two statements :

Statement (I) : Potassium hydrogen phthalate is a primary standard for standardisation of sodium hydroxide solution.

Statement (II) : In this titration phenolphthalein can be used as indicator.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement I and Statement II are correct

(2) Statement I is correct but Statement II is incorrect

(3) Statement I is incorrect but Statement II is correct

(4) Both Statement I and Statement II are incorrect

Q4 - 2024 (27 Jan Shift 2)

Which of the following cannot function as an oxidising agent?

(1) N^{3-}

(2) SO_4^{2-}

(3) BrO_3^-

(4) MnO_4^-

Q5 - 2024 (29 Jan Shift 1)

$KMnO_4$ decomposes on heating at 513 K to form O_2 along with

(1) MnO_2& K_2O_2

(2) K_2MnO_4&Mn

(3) Mn&KO_2

(4) K_2MnO_4&MnO_2

Q6 - 2024 (29 Jan Shift 1)

Chlorine undergoes disproportionation in alkaline medium as shown below :

a $Cl_2(g) + bOH^-(aq) \rightarrow cClO^-(aq) + dCl^-(aq) + e_2O(l)$

The values of a, b, c and d in a balanced redox reaction are respectively:

(1) 1, 2, 1 and 1

(2) 2, 2, 1 and 3

(3) 3, 4, 4 and 2

(4) 2, 4, 1 and 3

Q7 - 2024 (29 Jan Shift 2)

If 50 mL of 0.5M oxalic acid is required to neutralise 25 mL of NaOH solution, the amount of NaOH in 50 mL of given NaOH solution is _____ g.

Q8 - 2024 (30 Jan Shift 1)

$2MnO_4^- + bI^- + cH_2O \rightarrow xI_2 + yMnO_2 + zOH^-$

If the above equation is balanced with integer coefficients, the value of z is _____

Q9 - 2024 (30 Jan Shift 2)

Total number of species from the following which can undergo disproportionation reaction _____.

$H_2O_2, ClO_3^-, P_4, Cl_2, Ag, Cu^{+1}, F_2, NO_2, K^+$

Q10 - 2024 (31 Jan Shift 2)

Given below are two statements :

Statement I: S_8 solid undergoes disproportionation reaction under alkaline conditions to form S^{2-} and $S_2O_3^{2-}$

Statement II: ClO_4^- can undergo disproportionation reaction under acidic condition.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Statement I is correct but statement II is incorrect.

(2) Statement I is incorrect but statement II is correct

(3) Both statement I and statement II are incorrect

(4) Both statement I and statement II are correct

Answer Key

Q1 (4) **Q2** (1) **Q3** (1) **Q4** (1)

Q5 (4) **Q6** (1) **Q7** (4) **Q8** (8)

Q9 (6) **Q10** (1)

Q1

The balanced reaction is,

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

$X = 14$

$Y = 6$

$A = 7$

Q2

When a particular oxidation state becomes less stable relative to other oxidation state, one lower, one higher, it is said to undergo disproportionation.

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

$3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

Q3

Statement (I) : Potassium hydrogen phthalate is a primary standard for standardisation of sodium hydroxide solution as it is economical and its concentration does not changes with time.

Phenophthalin can acts as indicator in acid base titration as it shows colour in pH range 8.3 to 10.1

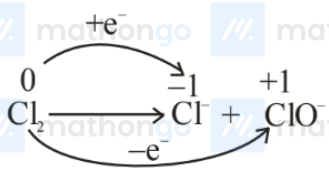
Q4

In N^{3-} ion ' N ' is present in its lowest possible oxidation state, hence it cannot be reduced further because of which it cannot act as an oxidizing agent.

Q5

$KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$

Q6



$\Rightarrow Cl_2 + 2\bar{O}H \longrightarrow Cl^- + ClO^- + H_2O$

Q7

Equivalent of Oxalic acid = Equivalents of NaOH

$50 \times 0.5 \times 2 = 25 \times M \times 1$

$M_{NaOH} = 2M$

W_{NaOH} in $50ml = 2 \times 50 \times 40 \times 10^{-3}$ g $= 4$ g

Q8

Reduction Half	Oxidation Half
$(2MnO_4^- \rightarrow 2MnO_2$	$2I^- \rightarrow I_2 + 2e^-$)
$2MnO_4^- + 4H_2O + 6e^- \rightarrow 2MnO_2 + 8OH^-$	$6I^- \rightarrow 3I_2 + 6e^-$

Adding oxidation half and reduction half, net reaction is

$2MnO_4^- + 6I^- + 4H_2O \rightarrow 3I_2 + 2MnO_2 + 8OH^-$

$(\Rightarrow z = 8$)

$\Rightarrow$ Ans 8

Q9

Intermediate oxidation state of element can undergo disproportionation.

$H_2O_2, ClO_3^-, P_4, Cl_2, Cu^{+1}, NO_2$

Q10

$S_1 : S_8 + 12OH^{\ominus} \rightarrow 4\ S^{2-} + 2\ S_2O_3^{2-} + 6H_2O$

$S_2 : ClO_4^{\ominus}$ cannot undergo disproportionation reaction as chlorine is present in it's highest oxidation state.