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CHEMISTRY · JEE MAIN

# Redox Reactions

## Previous Year Questions with answers

**78** questions · **68** papers · **2002–2026** · newest paper first

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**What is in this PDF:** every Redox Reactions question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

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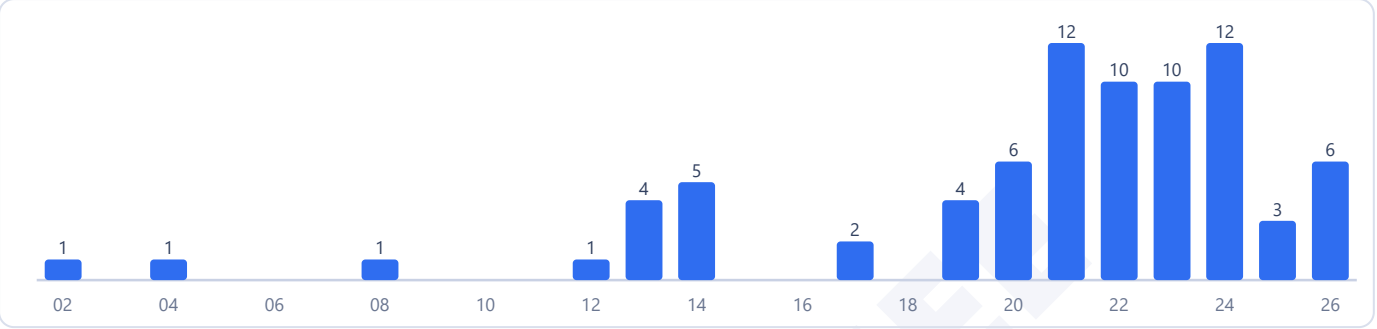
# Chapter at a glance

| 1.4% | 78 | 55 of 162 | 47 / 31 |
|---|---|---|---|
| of Chemistry questions, 2019–2026 | questions, 2002–2026 | papers asked it, 2019–2026 | MCQ / numerical, 2002–2026 |

**Trend.** Steady: 0.4 questions per paper in 2024–2026 against 0.4 in 2019–2023.

### Questions per year




Counts are the questions we hold: 78 in 68 papers. No question in this chapter was found repeated across papers.

### Most-asked topics in this chapter (2002–2026)

| | |
|---|---|
| Oxidation Number & Balancing | 53 |
| Redox Titrations | 25 |

## How often it comes up

Redox reactions examines oxidation-reduction principles and balancing methods under Unit 7: Redox Reactions and Electrochemistry in the Class 11 curriculum, holding rank 29 among all 31 chemistry chapters with a 1.4 percent share of total chemistry questions. In the computerized exam era spanning 2019 to 2026, candidates tackled 63 redox questions in 162 papers, representing an average rate of 0.4 questions per examination shift. The topic featured in 55 of those 162 papers, and questions appeared every single year throughout the cycle. During the recent 2024 to 2026 test cycles, examiners presented 21 questions across 58 papers, maintaining an average of 0.4 questions per shift and a 1.4 percent subject share. The chapter's share has stayed about the same when compared to the 2002 to 2018 window, which recorded 15 questions across 38 papers for a 1.1 percent share. Measured against the full 2019 to 2026 baseline, the recent share has also stayed about the same. In the 2026 exams specifically, 6 questions were set across 19 papers, showing up in 5 separate shifts. A notable 31 questions between 2019 and 2026 were formatted as numerical answer questions, meaning approximately half of all redox questions required exact numerical computation of equivalence volumes, transferred electrons, or oxidation states.

## Most-asked topics

Questions in this chapter concentrate across two focused conceptual areas:

- **Oxidation Number & Balancing**: 53 questions historically, with 40 delivered between 2019 and 2026, tested up to 2026. This dominant area tests oxidation number assignment in complex oxoacids and peroxo compounds, disproportionation reactions, comproportionation reactions, balancing equations in acidic and basic media by the ion-electron method, and determining total electrons transferred n for electrochemical cell potentials.
- **Redox Titrations**: 25 total problems, including 23 from 2019 to 2026, tested in 2026. Concepts evaluate permanganometric titrations using potassium permanganate, dichromatometric titrations using potassium dichromate, iodometric and iodimetric estimations using sodium thiosulfate, n-factor calculations, and equivalent weight determinations.

## What the questions look like

JEE Main problems in redox reactions emphasize stoichiometric electron accounting and volumetric equivalences:

- **Dichromatometric titration of ferrous salts**: Calculating the unknown molarity of potassium dichromate required to completely oxidize a specified volume of acidified Mohr's salt solution.
- **Iodometric thiosulfate titration**: Freeing elemental iodine from excess potassium iodide using alkaline permanganate or dichromate, followed by titrating the liberated iodine against standard sodium thiosulfate to determine volume or concentration.
- **Electron transfer numbers in balanced half-reactions**: Balancing a complex redox transformation in acidic solution and determining the total electron exchange number n required for substitution into the Nernst equation.
- **Disproportionation boundaries**: Evaluating which halogen or chlorine oxoanions can undergo self oxidation-reduction based on whether the halogen already occupies its maximum allowable oxidation state.

## How to practise it

Master n-factor calculations for primary laboratory oxidizing and reducing agents. In acidic medium, potassium permanganate undergoes a five-electron reduction to divalent manganese. In basic or neutral medium, it undergoes a three-electron reduction to manganese dioxide. Potassium dichromate in acidic medium always undergoes a six-electron reduction to two trivalent chromium ions.

Apply the law of chemical equivalence: gram equivalents of oxidizing agent equal gram equivalents of reducing agent. Convert molarity into normality by multiplying by the n-factor, which simplifies multi-step titration arithmetic into straightforward N1 V1 equals N2 V2 relations.

For assigning oxidation numbers, watch out for peroxo bonds. In compounds like Caro's acid or chromium pentoxide, calculating oxidation states by routine algebraic formulas gives impossibly high values; drawing structural Lewis representations identifies peroxo linkages with minus one oxygen states.

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**Q1** JEE Main 2026 · 6 Apr · Shift 2 Numerical

500 mL of 0.2 M $\mathrm{MnO_4^-}$ solution in basic medium when mixed with 500 mL of 1.5 M KI solution, oxidises iodide ions to liberate molecular iodine. This liberated iodine is then titrated with a standard $x$ M thiosulphate solution in presence of starch till the end point. If 300 mL of thiosulphate was consumed, then the value of $x$ is _____.

Numerical value type: the answer is a number.

**Answer: 1.** · Official NTA final key

**Q2** JEE Main 2026 · 4 Apr · Shift 1 MCQ

In order to oxidise a mixture of 1 mole each of $\mathrm{FeC_2O_4}$, $\mathrm{Fe_2(C_2O_4)_3}$, $\mathrm{FeSO_4}$ and $\mathrm{Fe_2(SO_4)_3}$ in acidic medium, the number of moles of $\mathrm{KMnO_4}$ required is

(A) 3
(B) 2
(C) 5
(D) 7

**Answer: (B) 2** · Official NTA final key

**Q3** JEE Main 2026 · 28 Jan · Shift 1 Numerical

500 mL of 1.2 M KI solution is mixed with 500 mL of 0.2 M $\mathrm{KMnO_4}$ solution in basic medium. The liberated iodine was titrated with standard 0.1 M $\mathrm{Na_2S_2O_3}$ solution in the presence of starch indicator till the blue color disappeared. The volume (in L) of $\mathrm{Na_2S_2O_3}$ consumed is _____. (Nearest integer)

Numerical value type: the answer is a number.

**Answer: 3.** · Official NTA final key

**Q4** JEE Main 2026 · 28 Jan · Shift 1 Numerical

Consider the following redox reaction taking place in acidic medium

$$\mathrm{BH_4^-}(aq) + \mathrm{ClO_3^-}(aq) \longrightarrow \mathrm{H_2BO_3^-}(aq) + \mathrm{Cl^-}(aq)$$

If the Nernst equation for the above balanced reaction is

$$\mathrm{E_{cell}} = \mathrm{E^\circ_{cell}} - \frac{\mathrm{RT}}{n\mathrm{F}} \ln \mathrm{Q},$$

then the value of n is _____. (Nearest integer)

Numerical value type: the answer is a number.

**Answer: 24.** · Official NTA final key

**Q5** JEE Main 2026 · 24 Jan · Shift 1 Numerical

X and Y are the number of electrons involved, respectively during the oxidation of $\mathrm{I^-}$ to $\mathrm{I_2}$ and $\mathrm{S^{2-}}$ to S by acidified $\mathrm{K_2Cr_2O_7}$. The value of X + Y is _____.

Numerical value type: the answer is a number.

**Answer: 12.** · Official NTA final key

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**Q6** JEE Main 2026 · 23 Jan · Shift 2 Numerical

200 cc of $x \times 10^{-3}$ M potassium dichromate is required to oxidise 750 cc of 0.6 M Mohr's salt solution in acidic medium.

Here $x$ = _____.

Numerical value type: the answer is a number.

**Answer: 375.** · Official NTA final key

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**Q7** JEE Main 2025 · 29 Jan · Shift 2 MCQ

0.1 M solution of KI reacts with excess of $H_2SO_4$ and $KIO_3$ solutions. According to equation $5I^- + IO_3^- + 6H^+ \rightarrow 3I_2 + 3H_2O$ Identify the correct statements : (A) 200 mL of KI solution reacts with 0.004 mol of $KIO_3$ (B) 200 mL of KI solution reacts with 0.006 mol of $H_2SO_4$ (C) 0.5 L of KI solution produced 0.005 mol of $I_2$ (D) Equivalent weight of $KIO_3$ is equal to ( $\frac{\text{Molecular weight}}{5}$ ) Choose the correct answer from the options given below :

(A) (A) and (D) only
(B) (C) and (D) only
(C) (B) and (C) only
(D) (A) and (B) only

**Answer: (A)** (A) and (D) only · Key from source paper

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**Q8** JEE Main 2025 · 28 Jan · Shift 1 MCQ

Match the LIST-I with LIST-II

| LIST-I (Redox Reaction) | LIST-II (Type of Redox Reaction) |
|---|---|
| A. $CH_{4(g)} + 2O_{2(g)} \xrightarrow{\Delta} CO_{2(g)} + 2H_2O_{(l)}$ | I. Disproportionation reaction |
| B. $2NaH_{(s)} \xrightarrow{\Delta} 2Na_{(s)} + H_{2(g)}$ | II. Combination reaction |
| C. $V_2O_{5(s)} + 5Ca_{(s)} \xrightarrow{\Delta} 2V_{(s)} + 5CaO_{(s)}$ | III. Decomposition reaction |
| D. $2H_2O_{2(aq)} \xrightarrow{\Delta} 2H_2O_{(l)} + O_{2(g)}$ | IV. Displacement reaction |

Choose the correct answer from the options given below:

(A) A-II, B-III, C-I, D-IV
(B) A-III, B-IV, C-I, D-II
(C) A-IV, B-I, C-II, D-III
(D) A-II, B-III, C-IV, D-I

**Answer: (D)** A-II, B-III, C-IV, D-I · Key from source paper

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**Q9** JEE Main 2025 · 22 Jan · Shift 2 MCQ

The species which does not undergo disproportionation reaction is :

(A) $ClO_3^-$
(B) $ClO^-$
(C) $ClO_2^-$
(D) $ClO_4^-$

**Answer: (D)** $ClO_4^-$ · Key from source paper

**Q10** JEE Main 2024 · 8 Apr · Shift 1 MCQ

Thiosulphate reacts differently with iodine and bromine in the reactions given below:

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

$S_2O_3^{2-} + 5Br_2 + 5H_2O \rightarrow 2SO_4^{2-} + 4Br^- + 10H^+$

Which of the following statement justifies the above dual behaviour of thiosulphate?

(A) Bromine is a stronger oxidant than iodine
(B) Thiosulphate undergoes oxidation by bromine and reduction by iodine in these reaction
(C) Bromine is a weaker oxidant than iodine
(D) Bromine undergoes oxidation and iodine undergoes reduction in these reactions

**Answer: (A) Bromine is a stronger oxidant than iodine** · Key from source paper

**Q11** JEE Main 2024 · 6 Apr · Shift 2 MCQ

Match List - I with List - II.

| List - I Reaction | List - II Type of redox reaction |
|---|---|
| (A) $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)}$ | (I) Decomposition |
| (B) $2\,Pb(NO_3)_{2(s)} \rightarrow 2PbO_{(s)} + 4NO_{2(g)} + O_{2(g)}$ | (II) Displacement |
| (C) $2Na_{(s)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq.} + H_{2(g)}$ | (III) Disproportionation |
| (D) $2NO_{2(g)} + 2\,^-OH_{(aq.)} \rightarrow NO^-_{2(aq.)} + NO^-_{3(aq.)} + H_2O_{(l)}$ | (IV) Combination |

Choose the correct answer from the options given below :

(A) (A)-(II), (B)-(III), (C)-(IV), (D)-(I)
(B) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)
(C) (A)-(IV), (B)-(I), (C)-(II), (D)-(III)
(D) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

**Answer: (C)** (A)-(IV), (B)-(I), (C)-(II), (D)-(III) · Key from source paper

**Q12** JEE Main 2024 · 4 Apr · Shift 1 Numerical

Only 2 mL of $KMnO_4$ solution of unknown molarity is required to reach the end point of a titration of 20 mL of oxalic acid (2M) in acidic medium. The molarity of $KMnO_4$ solution should be _____ M.

Numerical value type: the answer is a number.

**Answer: 8.** · Key from source paper

**Q13** JEE Main 2024 · 1 Feb · Shift 1 MCQ

Which of the following reactions are disproportionation reactions?

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

1. $3MnO_4^{2-} + 4H^{+} \rightarrow 2MnO_4^{-} + MnO_2 + 2H_2O$

1. $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$

1. $2MnO_4^{-} + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^{+}$

Choose the correct answer from the options given below:

(A) 1, 2
(B) 2, 3, 4
(C) 1, 2, 4
(D) 1, 4

**Answer: (A)** 1, 2 · Key from source paper

**Q14** JEE Main 2024 · 1 Feb · Shift 1 MCQ

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:

(A) 8, 6, 4 and $Cr_2O_3$
(B) 14, 7, 6 and $Cr^{3+}$
(C) 8, 4, 6 and $Cr_2O_3$
(D) 14, 6, 7 and $Cr^{3+}$

**Answer: (D)** 14, 6, 7 and $Cr^{3+}$ · Key from source paper

**Q15** JEE Main 2024 · 31 Jan · Shift 2 MCQ

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:

(A) Statement I is correct but statement II is incorrect.
(B) Statement I is incorrect but statement II is correct
(C) Both statement I and statement II are incorrect
(D) Both statement I and statement II are correct

**Answer: (A) Statement I is correct but statement II is incorrect.** · Key from source paper

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**Q16** JEE Main 2024 · 31 Jan · Shift 2 Numerical

Number of moles of $H^+$ ions required by 1 mole of $MnO_4^-$ to oxidise oxalate ion to $CO_2$ is _____.

Numerical value type: the answer is a number.

**Answer: 8.** · Key from source paper

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**Q17** JEE Main 2024 · 30 Jan · Shift 1 Numerical

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

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

Numerical value type: the answer is a number.

**Answer: 08.** · Key from source paper

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**Q18** JEE Main 2024 · 30 Jan · Shift 2 Numerical

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

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

Numerical value type: the answer is a number.

**Answer: 6.** · Key from source paper

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**Q19** JEE Main 2024 · 29 Jan · Shift 1 MCQ

Chlorine undergoes disproportionation in alkaline medium as shown below :

$aCl_2(g) + bOH^-(aq) \rightarrow cClO^-(aq) + dCl^-(aq) + eH_2O(l)$

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

(A) 1, 2, 1 and 1
(B) 2, 2, 1 and 3
(C) 3, 4, 4 and 2
(D) 2, 4, 1 and 3

**Answer: (A) 1, 2, 1 and 1** · Key from source paper

**Q20** JEE Main 2024 · 27 Jan · Shift 1 · Numerical

From the given list, the number of compounds with $+4$ oxidation state of Sulphur

$SO_3$, $H_2SO_3$, $SOCl_2$, $SF_4$, $BaSO_4$, $H_2S_2O_7$

Numerical value type: the answer is a number.

**Answer: 3.** · Key from source paper

**Q21** JEE Main 2024 · 27 Jan · Shift 2 · MCQ

Which of the following cannot function as an oxidising agent?

(A) $N^{3-}$
(B) $SO_4^{2-}$
(C) $BrO_3^-$
(D) $MnO_4^-$

**Answer: (A)** $N^{3-}$ · Key from source paper

**Q22** JEE Main 2023 · 15 Apr · Shift 1 · Numerical

The total change in the oxidation state of manganese involved in the reaction of $KMnO_4$ and potassium iodide in the acidic medium is _____.

Numerical value type: the answer is a number.

**Answer: 5.** · Key from source paper

**Q23** JEE Main 2023 · 13 Apr · Shift 1 · Numerical

$KMnO_4$ is titrated with ferrous ammonium sulphate hexahydrate in presence of dilute $H_2SO_4$. Number of water molecules produced for 2 molecules of $KMnO_4$ is _____

Numerical value type: the answer is a number.

**Answer: 68.** · Key from source paper

**Q24** JEE Main 2023 · 13 Apr · Shift 2 · Numerical

See the following chemical reaction:
$Cr_2O_7^{2-} + XH^+ + 6Fe^{2+} \rightarrow YCr^{3+} + 6Fe^{3+} + ZH_2O$
The sum of X, Y and Z is

Numerical value type: the answer is a number.

**Answer: 23.** · Key from source paper

**Q25** JEE Main 2023 · 8 Apr · Shift 1 · MCQ

$2IO_3^- + xI^- + 12H^+ \rightarrow 6I_2 + 6H_2$ What is the value of x?

(A) 2
(B) 12
(C) 10
(D) 6

**Answer: (C) 10** · Key from source paper

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**Q26** JEE Main 2023 · 6 Apr · Shift 1 MCQ

Which of the following options are correct for the reaction?

$2Au(CN)_2^-(aq) + Zn(s) \rightarrow 2Au(s) + Zn(CN)_4^{2-}(aq)$

A. Redox reaction

B. Displacement reaction

C. Decomposition reaction

D. Combination reaction

Choose the correct answer from the options given below:

(A) A only
(B) A and D only
(C) A and B only
(D) C and D only

**Answer: (C) A and B only** · Key from source paper

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**Q27** JEE Main 2023 · 6 Apr · Shift 1 Numerical

In ammonium - phosphomolybdate, the oxidation state of Mo is +_____

Numerical value type: the answer is a number.

**Answer: 6.** · Key from source paper

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**Q28** JEE Main 2023 · 31 Jan · Shift 1 MCQ

$H_2O_2$ acts as a reducing agent in

(A) $2NaOCl + H_2O_2 \rightarrow 2NaCl + H_2O + O_2$
(B) $2Fe^{2+} + 2H^+ + H_2O_2 \rightarrow 2Fe^{3+} + 2H_2O$
(C) $Mn^{2+} + 2H_2O_2 \rightarrow MnO_2 + 2H_2O$
(D) $Na_2S + 4H_2O_2 \rightarrow Na_2SO_4 + 4H_2O$

**Answer: (A)** $2NaOCl + H_2O_2 \rightarrow 2NaCl + H_2O + O_2$ · Key from source paper

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**Q29** JEE Main 2023 · 31 Jan · Shift 1 MCQ

When $Cu^{2+}$ ion is treated with KI, a white precipitate, X appears in solution. The solution is titrated with sodium thiosulphate, the compound Y is formed. X and Y respectively are

(A) X = $Cu_2I_2$, Y = $Na_2S_4O_5$
(B) X = $Cu_2I_2$, Y = $Na_2S_4O_6$
(C) X = $CuI_2$, Y = $Na_2S_4O_3$
(D) X = $CuI_2$, Y = $Na_2S_4O_6$

**Answer: (B)** X = $Cu_2I_2$, Y = $Na_2S_4O_6$ · Key from source paper

**Q30** JEE Main 2023 · 30 Jan · Shift 1 Numerical

The number of electrons involved in the reduction of permanganate to manganese dioxide in acidic medium is _____ .

Numerical value type: the answer is a number.

**Answer: 3.** · Key from source paper

**Q31** JEE Main 2023 · 29 Jan · Shift 2 MCQ

An indicator 'X' is used for studying the effect of variation in concentration of iodide on the rate of reaction of iodide ion with $H_2O_2$ at room temp. The indicator 'X' forms blue colored complex with compound 'A' present in the solution. The indicator 'X' and compound 'A' respectively are

(A) Starch and iodine
(B) Methyl orange and $H_2O_2$
(C) Starch and $H_2O_2$
(D) Methyl orange and iodine

**Answer: (A) Starch and iodine** · Key from source paper

**Q32** JEE Main 2022 · 28 Jul · Shift 2 MCQ

Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R
Assertion A : Permanganate titration are not performed in presence of hydrochloric acid.
Reason R : Chlorine is formed as a consequence of oxidation of hydrochloric acid.
In the light of the above statements, choose the correct answer from the options given below

(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is NOT the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true

**Answer: (A) Both A and R are true and R is the correct explanation of A** · Key from source paper

**Q33** JEE Main 2022 · 27 Jul · Shift 1 Numerical

20 mL of 0.02 M $K_2Cr_2O_7$ solution is used for the titration of 10 mL of $Fe^{2+}$ solution in the acidic medium. The molarity of $Fe^{2+}$ solution is _____ $\times 10^{-2}$M

Numerical value type: the answer is a number.

**Answer: 24.** · Key from source paper

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**Q34** JEE Main 2022 · 27 Jul · Shift 1 Numerical

In the titration of $KMnO_4$ and oxalic acid in acidic medium, the change in oxidation number of carbon at the end point is

Numerical value type: the answer is a number.

**Answer: 1.** · Key from source paper

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**Q35** JEE Main 2022 · 26 Jul · Shift 1 MCQ

Which of the given reactions is not an example of disproportionation reaction?

(A) $2H_2O_2 \rightarrow 2H_2O + O_2$

(B) $2\,NO_2 + H_2O \rightarrow HNO_3 + HNO_2$

(C) $MnO_4^- + 4H^+ + 3e^- \rightarrow MnO_2 + 2H_2O$

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

**Answer: (C)** $MnO_4^- + 4H^+ + 3e^- \rightarrow MnO_2 + 2H_2O$ · Key from source paper

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**Q36** JEE Main 2022 · 26 Jul · Shift 1 MCQ

The dark purple colour of $KMnO_4$ disappears in the titration with oxalic acid in acidic medium. The overall change in the oxidation number of manganese in the reaction is

(A) 5

(B) 1

(C) 7

(D) 2

**Answer: (A) 5** · Key from source paper

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**Q37** JEE Main 2022 · 26 Jul · Shift 2 Numerical

20 mL of 0.02 M hypo solution is used for the titration of 10 mL of copper sulphate solution, in the presence of excess of KI using starch as an indicator. The molarity of $Cu^{2+}$ is found to be _____ $\times 10^{-2}$ M (nearest integer)

Given : $2Cu^{2+} + 4I^- \rightarrow Cu_2I_2 + I_2I_2 + 2S_2O_3^{-2} \rightarrow 2I^- + S_4O_6^{-2}$

Numerical value type: the answer is a number.

**Answer: 4.** · Key from source paper

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**Q38** JEE Main 2022 · 28 Jun · Shift 1 Numerical

A 2.0 g sample containing $MnO_2$ is treated with HCl liberating $Cl_2$. The $Cl_2$ gas is passed into a solution of KI and 60.0 mL of 0.1 M $Na_2S_2O_3$ is required to titrate the liberated iodine. The

percentage of $MnO_2$ in the sample is _____. Nearest integer)
[Atomic masses (in u) Mn = 55; Cl = 35.5 : O = 16, I = 127, Na = 23, K = 39, S = 32]

Numerical value type: the answer is a number.

**Answer: 13.** · Key from source paper

**Q39** JEE Main 2022 · 28 Jun · Shift 2 Numerical

$0.01\ M\ KMnO_4$ solution was added to $20.0\ mL$ of $0.05M$ Mohr 's salt solution through a burette. The initial reading of $50\ mL$ burette is zero. The volume of $KMnO_4$ solution left in the burette after the end point is..... mL. (nearest integer)

Numerical value type: the answer is a number.

**Answer: 30.** · Key from source paper

**Q40** JEE Main 2022 · 26 Jun · Shift 2 MCQ

Which one of the following is an example of disproportionation reaction?

(A) $3\,MnO_4^{2-} + 4H^+ \rightarrow 2\,MnO_4^- + MnO_2 + 2H_2O$
(B) $MnO_4^- + 4H^+ + 4e^- \rightarrow MnO_2 + 2H_2O$
(C) $10I^- + 2\,MnO_4^- + 16H^+ \rightarrow 2\,Mn^2 + +8H_2O+$
(D) $8\,MnO_4^- + 3\,S_2O_3^{2-} + H_2O \rightarrow 8\,MnO_2 + 6\,SO_4^{2-} + 2OH$

**Answer: (A)** $3\,MnO_4^{2-} + 4H^+ \rightarrow 2\,MnO_4^- + MnO_2 + 2H_2O$ · Key from source paper

**Q41** JEE Main 2022 · 24 Jun · Shift 2 Numerical

Manganese (VI) has ability to disproportionate in acidic solution. The difference in oxidation states of two ions it forms in acidic solution is

Numerical value type: the answer is a number.

**Answer: 3.** · Key from source paper

**Q42** JEE Main 2021 · 31 Aug · Shift 2 MCQ

In which one of the following sets all species show disproportionation reaction?

(A) $ClO_4^-$, $MnO_4^-$, $ClO_2^-$ and $F_2$
(B) $MnO_4^{2-}$, $ClO_2^-$, $Cl_2$ and $Mn^{3+}$
(C) $Cr_2O_7^{2-}$, $MnO_4^-$, $ClO_2^-$ and $Cl_2$
(D) $ClO_2^-$, $F_2$, $MnO_4^-$ and $Cr_2O_7^{2-}$

**Answer: (B)** $MnO_4^{2-}$, $ClO_2^-$, $Cl_2$ **and** $Mn^{3+}$ · Key from source paper

**Q43** JEE Main 2021 · 27 Aug · Shift 1 Numerical

When 10 mL of an aqueous solution of $KMnO_4$ was titrated in acidic medium, equal volume of $0.1M$ of an aqueous solution of ferrous sulphate was required for complete discharge of colour. The

strength of $KMnO_4$ in grams per litre is _____$\times 10^{-2}$. (Nearest integer) [Atomic mass of K = 39, Mn = 55, O = 16]

Numerical value type: the answer is a number.

**Answer: 316.** · Key from source paper

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**Q44** JEE Main 2021 · 27 Jul · Shift 2 Numerical

$10.0\ mL$ of $0.05\ M\ KMnO_4$ solution was consumed in a titration with $10.0\ mL$ of given oxalic acid dihydrate solution. The strength of given oxalic acid solution is _____ $\times 10^{-2}$ g/L. (Round off to the nearest integer)

Numerical value type: the answer is a number.

**Answer: 1575.** · Key from source paper

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**Q45** JEE Main 2021 · 25 Jul · Shift 1 Numerical

When $10\ mL$ of an aqueous solution of $Fe^{2+}$ ions was titrated in the presence of dil $H_2SO_4$ using diphenylamine indicator, $15\ mL$ of $0.02\ M$ solution of $K_2Cr_2O_7$ was required to get the end point. The molarity of the solution containing $Fe^{2+}$ ions is $x \times 10^{-2}\ M$. The value of x is _____. (Nearest integer)

Numerical value type: the answer is a number.

**Answer: 18.** · Key from source paper

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**Q46** JEE Main 2021 · 25 Jul · Shift 2 MCQ

Identify the process in which change in the oxidation state is five :

(A) $Cr_2\ O_7^{2-} \rightarrow 2\ Cr^{3+}$

(B) $MnO_4^- \rightarrow Mn^{2+}$

(C) $CrO_4^{2-} \rightarrow Cr^{3+}$

(D) $C_2O_4^{2-} \rightarrow 2\ CO_2$

**Answer: (B)** $MnO_4^- \rightarrow Mn^{2+}$ · Key from source paper

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**Q47** JEE Main 2021 · 20 Jul · Shift 1 MCQ

The species given below that does NOT show disproportionation reaction is:

(A) $BrO_4^-$

(B) $BrO^-$

(C) $BrO_2^-$

(D) $BrO_3^-$

**Answer: (A)** $BrO_4^-$ · Key from source paper

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**Q48** JEE Main 2021 · 18 Mar · Shift 2 MCQ

The oxidation states of nitrogen in $NO$, $NO_2$, $N_2O$ and $NO_3^-$ are in the order of :

(A) $NO_3^- > NO_2 > NO > N_2O$
(B) $NO_2 > NO_3^- > NO > N_2O$
(C) $N_2O > NO_2 > NO > NO_3^-$
(D) $NO > NO_2 > N_2O > NO_3^-$

**Answer: (A)** $NO_3^- > NO_2 > NO > N_2O$ · Key from source paper

**Q49** JEE Main 2021 · 17 Mar · Shift 1 Numerical

15 mL of aqueous solution of $Fe^{2+}$ in acidic medium completely reacted with 20 mL of 0.03 M aqueous $Cr_2O_7^{2-}$. The molarity of the $Fe^{2+}$ solution is _____ $\times 10^{-2} M$ (Round off to the Nearest Integer).

Numerical value type: the answer is a number.

**Answer: 24.** · Key from source paper

**Q50** JEE Main 2021 · 16 Mar · Shift 1 Numerical

$2MnO_4^- + bC_2O_4^{2-} + cH^+ \rightarrow xMn^{2+} + yCO_2 + zH_2O$

If the above equation is balanced with integer coefficients, the value of c is _____. (Round off to the Nearest Integer).

Numerical value type: the answer is a number.

**Answer: 16.** · Key from source paper

**Q51** JEE Main 2021 · 25 Feb · Shift 1 Numerical

In basic medium $CrO_4^{2-}$ oxidises $S_2O_3^{2-}$ to form $SO_4^{2-}$ and itself changes into $Cr(OH)_4^-$. The volume of $0.154\ M\ CrO_4^{2-}$ required to react with $40\ mL$ of $0.25\ M\ S_2O_3^{2-}$ is _____ mL. (Rounded-off to the nearest integer)

Numerical value type: the answer is a number.

**Answer: 173.** · Key from source paper

**Q52** JEE Main 2021 · 24 Feb · Shift 1 MCQ

(A) $HOCl + H_2O_2 \rightarrow H_3O^+ + Cl^- + O_2$
(B) $I_2 + H_2O_2 + 2OH^- \rightarrow 2I^- + 2H_2O + O_2$
Choose the correct option.

(A) $H_2O_2$ act as oxidizing and reducing agent respectively in equations (A) and (B).
(B) $H_2O_2$ acts as oxidising agent in equations (A) and (B).
(C) $H_2O_2$ acts as reducing and oxidising agent respectively in equations (A) and (B).
(D) $H_2O_2$ acts as reducing agent in equations (A) and (B).

**Answer: (D) $H_2O_2$ acts as reducing agent in equations (A) and (B).** · Key from source paper

**Q53** JEE Main 2021 · 24 Feb · Shift 1 Numerical

The reaction of sulphur in alkaline medium is given below:
$S_{8s} + a\ OH^-_{aq} \rightarrow b\ S^{2-}_{aq} + c\ S_2O^{2-}_{3aq} + d\ H_2O_l$
The values of 'a' is _____ (Integer answer)

Numerical value type: the answer is a number.

**Answer: 12.** · Key from source paper

**Q54** JEE Main 2020 · 5 Sep · Shift 2 Numerical

The volume, in mL, of 0. 02 $MK_2Cr_2O_7$, solution required to react with 0. 288g of ferrous oxalate in acidic medium is_____ (Molar mass of Fe = 56 $gmol^{-1}$ )

Numerical value type: the answer is a number.

**Answer: 50.** · Checked by our team

**Q55** JEE Main 2020 · 4 Sep · Shift 1 Numerical

A $20.0\ mL$ solution containing $0.2\ g$ impure $H_2O_2$ reacts completely with $0.316\ g$ of $KMnO_4$ in acid solution. The purity of $H_2O_2$ (in %) is _____ (mol. wt. of $H_2O_2 = 34$; mol. wt. of $KMnO_4 = 158$)

Numerical value type: the answer is a number.

**Answer: 85.** · Key from source paper

**Q56** JEE Main 2020 · 4 Sep · Shift 2 Numerical

Consider the following equations :
$2\ Fe^{2+} + H_2O_2 \rightarrow xA + yB$
(in basic medium)
$2\ MnO_4^- + 6H^+ + 5H_2O_2 \rightarrow x'C + y'D + z'E$
(in acidic medium)
The sum of the stoichiometric coefficients $x, y, x', y'$ and $z'$ for products $A, B, C, D$ and $E$ respectively, is _____

Numerical value type: the answer is a number.

**Answer: 19.** · Key from source paper

**Q57** JEE Main 2020 · 9 Jan · Shift 1 MCQ

The compound that cannot act both as oxidizing and reducing agent is

(A) $H_3PO_4$
(B) $HNO_2$
(C) $H_2SO_3$
(D) $H_2O_2$

**Answer: (A)** $H_3PO_4$ · Key from source paper

**Q58** JEE Main 2020 · 7 Jan · Shift 1 MCQ

Oxidation number of potassium in $K_2O$, $K_2O_2$ and $KO_2$, respectively, is:

(A) $+2, +1$ and $+\frac{1}{2}$
(B) $+1, +1$ and $+1$
(C) $+1, +4$ and $+2$
(D) $+1, +2$ and $+4$

**Answer: (B)** $+1, +1$ and $+1$ · Key from source paper

**Q59** JEE Main 2020 · 7 Jan · Shift 2 MCQ

The redox reaction among the following is

(A) formation of ozone from atmospheric oxygen in the presence of sunlight
(B) reaction of $[Co(H_2O)_6]Cl_3$ with $AgNO_3$
(C) reaction of $H_2SO_4$ with $NaOH$
(D) combination of dinitrogen with dioxygen at $2000K$

**Answer: (D) combination of dinitrogen with dioxygen at** $2000K$ · Key from source paper

**Q60** JEE Main 2019 · 12 Apr · Shift 1 MCQ

An example of a disproportionation reaction is

(A) $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$
(B) $2MnO_4^- + 10I^- + 16\ H^+ \rightarrow 2\ Mn^{2+} + 5I_2 + 8H_2O$
(C) $2\ CuBr \rightarrow CuBr_2 + Cu$
(D) $2\ NaBr + Cl_2 \rightarrow 2NaCl + Br_2$

**Answer: (C)** $2\ CuBr \rightarrow CuBr_2 + Cu$ · Key from source paper

**Q61** JEE Main 2019 · 9 Apr · Shift 1 MCQ

The correct order of the oxidation states of nitrogen in NO, $N_2O$, $NO_2$ and $N_2O_3$ is

(A) $N_2O < NO < N_2O_3 < NO_2$
(B) $NO_2 < N_2O_3 < NO < N_2O$
(C) $NO_2 < NO < N_2O_3 < N_2O$
(D) $N_2O < N_2O_3 < NO < NO_2$

**Answer: (A)** $N_2O < NO < N_2O_3 < NO_2$ · Key from source paper

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**Q62** JEE Main 2019 · 8 Apr · Shift 1 MCQ

In order to oxidize a mixture of one mole of each of $FeC_2O_4$, $Fe_2(C_2O_4)_3$, $FeSO_4$ and $Fe_2(SO_4)_3$ in acidic medium, the number of moles of $KMnO_4$ is:

(A) 1
(B) 2
(C) 3
(D) 1.5

**Answer: (B)** 2 · Key from source paper

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**Q63** JEE Main 2019 · 10 Jan · Shift 2 MCQ

In the reaction of oxalate with permanganate in acidic medium, the number of electrons involved in producing one molecule of $CO_2$ is:

(A) 2
(B) 10
(C) 1
(D) 5

**Answer: (C)** 1 · Key from source paper

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**Q64** JEE Main 2017 · 8 Apr · Online MCQ

In which of the following reactions, hydrogen peroxide acts as an oxidizing agent?

(A) $HOCl + H_2O_2 \rightarrow H_3O^+ + Cl^- + O_2$
(B) $I_2 + H_2O_2 + 2OH^- \rightarrow 2I^- + 2H_2O + O_2$
(C) $PbS + 4H_2O_2 \rightarrow PbSO_4 + 4H_2O$
(D) $2MnO_4^- + 3H_2O_2 \rightarrow 2MnO_2 + 3O_2 + 2H_2O + 2OH^-$

**Answer: (C)** $PbS + 4H_2O_2 \rightarrow PbSO_4 + 4H_2O$ · Key from source paper

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**Q65** JEE Main 2017 · 2 Apr · Offline MCQ

Which of the following reactions is an example of a redox reaction?

(A) $XeF_2 + PF_5 \rightarrow XeF^+PF_6$

(B) $XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$

(C) $XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

(D) $XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$

**Answer: (D)** $XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$ · Key from source paper

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**Q66** JEE Main 2014 · 19 Apr · Online MCQ

How many electrons are involved in the following redox reaction ?

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

(A) $6$

(B) $5$

(C) $3$

(D) $4$

**Answer: (A)** $6$ · Key from source paper

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**Q67** JEE Main 2014 · 19 Apr · Online MCQ

Consider the reaction :

$H_2SO_{3(aq)} + Sn^{4+}_{(aq)} + H_2O_{(l)} \rightarrow Sn^{2+}_{(aq)} + HSO^-_{4(aq)} + 3H^+_{(aq)}$

Which of the following statements is correct ?

(A) $Sn^{4+}$ is the oxidizing agent because it undergoes oxidation

(B) $Sn^{4+}$ is the reducing agent because it undergoes oxidation

(C) $H_2SO_3$ is the reducing agent because it undergoes reduction

(D) $H_2SO_3$ is the reducing agent because it undergoes oxidation

**Answer: (D)** $H_2SO_3$ **is the reducing agent because it undergoes oxidation** · Key from source paper

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**Q68** JEE Main 2014 · 19 Apr · Online MCQ

Amongst the following, identify the species with an atom in $+6$ oxidation state.

(A) $CrO_2Cl_2$

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

(C) $Cr_2O_3$

(D) $[MnO_4]^-$

**Answer: (A)** $CrO_2Cl_2$ · Key from source paper

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**Q69** JEE Main 2014 · 12 Apr · Online MCQ

Hydrogen peroxide acts both as an oxidising and as a reducing agent depending upon the nature of the reacting species. In which of the following cases $H_2O_2$ acts as a reducing agent in acid medium?

(A) $MnO_4^-$
(B) $Cr_2O_7^{2-}$
(C) $SO_3^{2-}$
(D) $KI$

**Answer: (A)** $MnO_4^-$ · Key from source paper

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**Q70** JEE Main 2014 · 6 Apr · Offline MCQ

In which of the following reactions $H_2O_2$ acts as a reducing agent ?
(a) $H_2O_2 + 2H^+ + 2e^- \rightarrow 2H_2O$
(b) $H_2O_2 - 2e^- \rightarrow O_2 + 2H^+$
(c) $H_2O_2 + 2e^- \rightarrow 2OH^-$
(d) $H_2O_2 + 2OH^- - 2e^- \rightarrow O_2 + 2H_2O$

(A) (a) , (b)
(B) (c) , (d)
(C) (a) , (c)
(D) (b) , (d)

**Answer: (D)** (b) , (d) · Key from source paper

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**Q71** JEE Main 2013 · 25 Apr · Online MCQ

Which one of the following cannot function as an oxidising agent?

(A) $I^-$
(B) S(s)
(C) $NO_3^-$(aq)
(D) $Cr_2O_7^{2-}$

**Answer: (A)** $I^-$ · Key from source paper

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**Q72** JEE Main 2013 · 22 Apr · Online MCQ

Oxidation state of sulphur in anions $SO_3^{2-}$, $S_2O_4^{2-}$ and $S_2O_6^{2-}$ increases in the orders :

(A) $S_2O_6^{2-} < S_2O_4^{2-} < SO_3^{2-}$
(B) $SO_3^{2-} < S_2O_4^{2-} < S_2O_6^{2-}$
(C) $S_2O_4^{2-} < SO_3^{2-} < S_2O_6^{2-}$
(D) $S_2O_4^{2-} < S_2O_6^{2-} < SO_3^{2-}$

**Answer: (C)** $S_2O_4^{2-} < SO_3^{2-} < S_2O_6^{2-}$ · Key from source paper

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**Q73** JEE Main 2013 · 9 Apr · Online MCQ

Given : $XNa_2HAsO_3 + YNaBrO_3 + ZHCl \rightarrow NaBr + H_3AsO_4 + NaCl$ The values of X, Y and Z in the above redox reaction are respectively :

(A) 2, 1, 2
(B) 2, 1, 3
(C) 3, 1, 6
(D) 3, 1, 4

**Answer: (C) 3, 1, 6** · Key from source paper

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**Q74** JEE Main 2013 · 7 Apr · Offline MCQ

Consider the following reaction:
$x\ \mathrm{MnO_4^-} + y\ \mathrm{C_2O_4^{2-}} + z\mathrm{H^+} \longrightarrow x\ \mathrm{Mn^{2+}} + 2y\ \mathrm{CO_2} + \frac{z}{2}\mathrm{H_2O}$
The values of x, y and z in the reaction are, respectively:

(A) 2, 5 and 16
(B) 5, 2 and 8
(C) 5, 2 and 16
(D) 2, 5 and 8

**Answer: (A) 2, 5 and 16** · Key from source paper

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**Q75** AIEEE 2012 · 12 May · Online MCQ

$X\ \mathrm{MnO_4^-} + Y\ \mathrm{C_2O_4^{2-}} + Z\ \mathrm{H^+} \rightleftharpoons X\ \mathrm{Mn^{2+}} + 2Y\ \mathrm{CO_2} + \frac{Z}{2}\mathrm{H_2O}$
In the following balanced reaction, values of $X, Y$ and $Z$ respectively are

(A) $2, 5, 16$
(B) $8, 2, 5$
(C) $5, 2, 16$
(D) $5, 8, 4$

**Answer: (A)** $2, 5, 16$ · Key from source paper

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**Q76** AIEEE 2008 MCQ

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

(A) gets oxidised by oxalic acid to chlorine
(B) furnishes $\mathrm{H^+}$ions in addition to those from oxalic acid
(C) reduces permanganate to $\mathrm{Mn^{2+}}$
(D) oxidises oxalic acid to carbon dioxide and water

**Answer: (C) reduces permanganate to** $\mathrm{Mn^{2+}}$ · Key from source paper

**Q77** AIEEE 2004 MCQ

Excess of KI reacts with $CuSO_4$ solution and then $Na_2\ S_2O_3$ solution is added to it. Which of the statements is incorrect for this reaction?

(A) $Cu_2I_2$ is reduced
(B) Evolved $I_2$ is reduced
(C) $Na_2\ S_2O_3$ is oxidized
(D) $CuI_2$ is formed

**Answer: (D)** $CuI_2$ **is formed** · Key from source paper

**Q78** AIEEE 2002 MCQ

Which of the following is a redox reaction ?

(A) $NaCl + KNO_3 \rightarrow NaNO_3 + KCl$
(B) $CaC_2O_4 + 2HCl \rightarrow CaCl_2 + H_2C_2O_4$
(C) $Mg(OH)_2 + 2NH_4Cl \rightarrow MgCl_2 + 2NH_4OH$
(D) $Zn + 2AgCN \rightarrow 2Ag + Zn(CN)_2$

**Answer: (D)** $Zn + 2AgCN \rightarrow 2Ag + Zn(CN)_2$ · Key from source paper

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