JEE Mains 2019 Chapter wise Question Bank

Redox Reactions - Questions

Q1

Consider the following reduction processes:
$Zn^{2+} + 2e^- \rightarrow Zn(s)$; $E^\circ = -0.76$ V
$Ca^{2+} + 2e^- \rightarrow Ca(s)$; $E^\circ = -2.87$ V
$Mg^{2+} + 2e^- \rightarrow Mg(s)$; $E^\circ = -2.36$ V
$Ni^{2+} + 2e^- \rightarrow Ni(s)$; $E^\circ = -0.25$ V
The reducing power of the metals increases in the order:
(1) Ca < Zn < Mg < Ni
(2) Ni < Zn < Mg < Ca
(3) Zn < Mg < Ni < Ca
(4) Ca < Mg < Zn < Ni

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Q2

In the reaction of oxalate with permanganate in acidic medium, the number of electrons involved in producing one molecule of CO_2 is:
(1) 1 (2) 10
(3) 2 (4) 5

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Q3

In order to oxidise 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 $KMnO_4$ required is :
(1) 2 (2) 1 (3) 3 (4) 1.5

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Q4

An example of a disproportionation reaction is:
(1) $2MnO_4^- + 10I^- + 16H^+ \rightarrow 2Mn^{2+} + 5I_2 + 8H_2O$
(2) $2NaBr + Cl_2 \rightarrow 2NaCl + Br_2$
(3) $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$
(4) $2CuBr \rightarrow CuBr_2 + Cu$

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Redox Reactions – Answers

Q1

(2) Higher the oxidation potential, higher will be the reducing power. So, the order of reducing behaviour is:

$$Ca > Mg > Zn > Ni$$

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Q2

(1) Reaction involved:

$$\overset{+3}{C_2}O_4^{2-} \longrightarrow 2\overset{+4}{C}O_2 + 2e^-$$

Oxidation number of C-atom increased.

$\therefore$ The number of electrons involved in producing one mole of CO_2 is 1.

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Q3

(1) $MnO_4^- + 5e^- \longrightarrow M_n^{2+}$

(i) $FeC_2O_4 \longrightarrow Fe^{3+} + 2CO_2 + 3e^-$

1 mole of FeC_2O_4 reacts with $\frac{3}{5}$ mole of acidified $KMnO_4$

(ii) $Fe_2(C_2O_4)_3 \longrightarrow Fe^{3+} + CO_2 + 6e^-$

1 mole of $Fe_2(C_2O_4)_3$ reacts with $\frac{6}{5}$ moles of $KMnO_4$

(iii) $FeSO_4 \longrightarrow Fe^{3+} + e^-$

1 mole of $FeSO_4$ react with $\frac{1}{5}$ moles of $KMnO_4$

(iv) $Fe_2(SO_4)_3$ does not oxidise

$\therefore$ Total moles required $= \frac{3}{6} + \frac{6}{5} + \frac{1}{5} = 2$

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Q4

(4) $\overset{+}{Cu}Br \longrightarrow \overset{0}{Cu} + \overset{2+}{Cu}Br_2$

It is an example of disproportionation reaction, as Cu undergoes both oxidation and reduction.

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