REDOX

1. The hardness of a water sample (in terms of equivalents of $CaCO_3$) containing 10^{-3} M $CaSO_4$ is :
(molar mass of $CaSO_4$ = 136 g mol^{-1})
(1) 100 ppm
(2) 50 ppm
(3) 10 ppm
(4) 90 ppm

2. 50 mL of 0.5 M oxalic acid is needed to neutralize 25 mL of sodium hydroxide solution. The amount of NaOH in 50 mL of the given sodium hydroxide solution is :
(1) 4 g (2) 2 g (3) 8 g (4) 1 g

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

4. The chemical nature of hydrogen preoxide is :-
(1) Oxidising and reducing agent in acidic medium, but not in basic medium.
(2) Oxidising and reducing agent in both acidic and basic medium
(3) Reducing agent in basic medium, but not in acidic medium
(4) Oxidising agent in acidic medium, but not in basic medium.

5. In order to oxidise a mixture 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) 3 (2) 2
(3) 1 (4) 1.5

6. 100 mL of a water sample contains 0.81 g of calcium bicarbonate and 0.73 of magnesium bicarbonate. The hardness of this water sample expressed in terms of equivalents of $CaCO_3$ is:
(molar mass of calcium bicarbonate is 162 g mol^{-1} and magnesium bicarbonate is 146 $gmol^{-1}$)
(1) 1,000 ppm (2) 10,000 ppm
(3) 100 ppm (4) 5,000 ppm

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

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SOLUTION

1. Ans. (1)

ppm of $CaCO_3$

$(10^{-3} \times 10^3) \times 100 = 100$ ppm

2. BONUS

$H_2C_2O_4 + 2NaOH \longrightarrow Na_2C_2O_4 + 2H_2O$

m_{eq} of $H_2C_2O_4 = m_{eq}$ NaOH

$50 \times 0.5 \times 2 = 25 \times M_{NaOH} \times 1$

$\therefore \quad M_{NaOH} = 2$ M

Now 1000 ml solution = 2×40 gram NaOH

$\therefore$ 50 ml solution = 4 gram NaOH

3. Ans. (3)

$$2\overset{+7}{M}nO_4 + 5C_2O_4^{2-} + 16H^+ \longrightarrow 2\overset{+2}{M}n^{2+} + 10CO_2 + 8H_2O$$

10 e^- transfer for 10 molecules of CO_2 so per molecule of CO_2 transfer of e^- is '1'

4. Ans. (2)

H_2O_2 act as oxidising agent and reducing agent in acidic medium as well as basic medium.

H_2O_2 Act as oxidant :-

$H_2O_2 + 2H^{\oplus} + 2e^{\ominus} \rightarrow 2H_2O$ (In acidic medium)

$H_2O + 2e^{\ominus} \rightarrow 2OH^{\ominus}$ (In basic medium)

H_2O_2 Act as reductant :-

$H_2O_2 \rightarrow 2H^+ + O_2 + 2e^{\ominus}$ (In acidic medium)

$H_2O_2 + 2OH^{\ominus} \rightarrow 2H_2O + O_2 + 2e^{\ominus}$ (In basic medium)

5. Ans. (2)

Sol. $n_{eq.}\ KMnO_4 = n_{eq.}[FeC_2O_4 + Fe_2(C_2O_4)_3 + FeSO_4]$

or $n \times 5 = 1 \times 3 + 1 \times 6 + 1 \times 1$

$\therefore \ n = 2$

Correct option : (2)

6. Ans. (2)

Sol. $n_{eq.}CaCO_3 = n_{eq}Ca(HCO_3)_2 + n_{eq}Mg(HCO_3)_2$

$$\text{or}, \ \frac{W}{100} \times 2 = \frac{0.81}{162} \times 2 + \frac{0.73}{146} \times 2$$

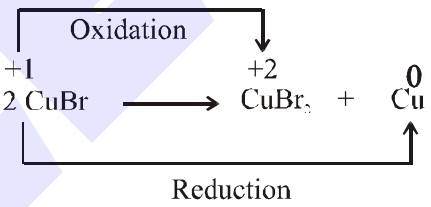
$\therefore \ w = 1.0$

$$\therefore \text{ Hardness} = \frac{1.0}{100} \times 10^6 = 10000 \text{ppm}$$

Correct option : (2)

7. Ans. (3)

Sol.



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