

Questions with Answer Keys

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Q1 (20 July 2021 Shift 1)

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

- (1) BrO_4^-
- (2) BrO^-
- (3) BrO_2^-
- (4) BrO_3^-

Q2 (20 July 2021 Shift 1)

250 mL of 0.5M NaOH was added to 500 mL of 1M HCl. The number of unreacted HCl molecules in the solution after complete reaction is $___ \times 10^{21}$ (Nearest integer)

($N_A = 6.022 \times 10^{23}$)

Q3 (20 July 2021 Shift 2)

Cu^{2+} salt reacts with potassium iodide to give

- (1) Cu_2I_2
- (2) Cu_2I_3
- (3) CuI
- (4) $\text{Cu}(\text{I}_3)_2$

Q4 (20 July 2021 Shift 2)

4 g equimolar mixture of NaOH and Na_2CO_3 contains xg of NaOH and yg of Na_2CO_3 . The value of x is $___ \text{ g}$ (Nearest integer)

Q5 (25 July 2021 Shift 1)

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 0.02M solution of $\text{K}_2\text{Cr}_2\text{O}_7$ was required to get the end point. The

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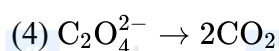
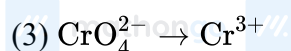
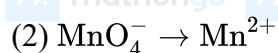
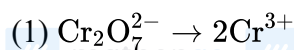
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molarity of the solution containing Fe^{2+} ions is $x \times 10^{-2}\text{M}$. The value of x is

(Nearest integer)

Q6 (25 July 2021 Shift 2)

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



Q7 (27 July 2021 Shift 1)

The oxidation states of 'P' in $\text{H}_4\text{P}_2\text{O}_7$, $\text{H}_4\text{P}_2\text{O}_5$ and

$\text{H}_4\text{P}_2\text{O}_6$, respectively, are :

(1) 7,5 and 6

(2) 5,4 and 3

(3) 5,3 and 4

(4) 6,4 and 5

Q8 (27 July 2021 Shift 2)

10.0 mL of 0.05MKMnO₄ solution was consumed

in a titration with 10.0 mL of given oxalic acid dihydrate solution. The strength of given oxalic acid solution is

$\dots \times 10^{-2}$ g/L.

(Round off to the nearest integer)

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Answer Key

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Q1 (1)**Q2 (226)****Q3 (1)****Q4 (1)**

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Q5 (18)**Q6 (2)****Q7 (3)****Q8 (1575)**

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Hints and Solutions

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Q1

In BrO_4^- , Br is in highest oxidation state (+7), So it cannot oxidise further hence it cannot show disproportionation reaction.

Q2

We know that no. of moles = $V_{\text{litite}} \times \text{Molarity}$

& No. of millimoles = $V_{\text{ml}} \times \text{Molarity}$

so millimoles of NaOH = $250 \times 0.5 = 125$

Millimoles of HCl = $500 \times 1 = 500$

Now reaction is $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

$t = 0$	125	500	0	0
$t = t$	0	375	125	125

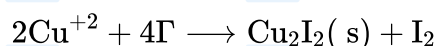
so millimoles of HCl left = 375 Moles of HCl = 375×10^{-3}

No. of HCl molecules = $6.022 \times 10^{23} \times 375 \times 10^{-3}$

= 225.8×10^{21}

$\simeq 226 \times 10^{21} = 226$

Q3



Q4

Total mass = 4 g

Now

$$\text{NaOH} : a \text{ mol} \quad W_{\text{NaOH}} + W_{\text{Na}_2\text{CO}_3} = 4$$

$$\text{Na}_2\text{CO}_3 : 'a' \text{ mol} \Rightarrow 40a + 106a = 4$$

$$\Rightarrow a = \frac{4}{146} \text{ mol}$$

$$\Rightarrow \text{therefore mass of NaOH is : } \frac{4}{146} \times 40 \text{ g}$$

$$= 1.095 \approx 1$$

Hints and Solutions

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Q5

milli-equivalents of Fe^{2+} = milli-equivalents of $\text{K}_2\text{Cr}_2\text{O}_7$

$$M \times 10 \times 1 = 0.02 \times 15 \times 6$$

$$M = 0.18 = 18 \times 10^{-2} \text{M}$$

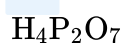
Q6



Q7

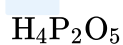
Oxidation state of P in $\text{H}_4\text{P}_2\text{O}_7$, $\text{H}_4\text{P}_2\text{O}_5$ and $\text{H}_4\text{P}_2\text{O}_6$

is 5, 3&4 respectively



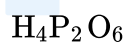
$$2x + 4(+1) + 7(-2) = 0$$

$$x = +5$$



$$2x + 4(+1) + 5(-2) = 0$$

$$x = +3$$



$$2x + 4(+1) + 6(-2) = 0$$

$$x = +4$$

Q8

$$n_{\text{eq}} \text{KMnO}_4 = n_{\text{eq}} \text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$$

$$\text{or, } \frac{10 \times 0.05}{1000} \times 5 = \frac{10 \times M}{1000} \times 2$$

$$\therefore \text{Conc. of oxalic acid solution} = 0.125 \text{M}$$

$$= 0.125 \times 126 \text{ g/L} = 15.75 \text{ g/L}$$

$$= 1575 \times 10^{-2} \text{ g/L}$$