Q1 - 2024 (01 Feb Shift 1)

Consider the following reaction:

$3PbCl_2 + 2(NH_4)_3PO_4 \rightarrow Pb_3(PO_4)_2 + 6NH_4Cl$

If 72mmol of $PbCl_2$ is mixed with 50mmol of $(NH_4)_3PO_4$, then amount of $Pb_3(PO_4)_2$ formed is _____ mmol. (nearest integer)

Q2 - 2024 (01 Feb Shift 2)

10 mL of gaseous hydrocarbon on combustion gives 40 mL of $CO_2(g)$ and 50 mL of water vapour. Total number of carbon and hydrogen atoms in the hydrocarbon is _____.

Q3 - 2024 (27 Jan Shift 1)

Mass of methane required to produce 22 g of CO_2 after complete combustion is _____ g.

(Given Molar mass in g mol-1

$C = 12.0$

$H = 1.0$

$O = 16.0)$

Q4 - 2024 (27 Jan Shift 2)

Volume of 3MNaOH (formula weight 40 g mol^{-1}) which can be prepared from 84 g of NaOH is _____ $\times 10^{-1} dm^3$.

Q5 - 2024 (27 Jan Shift 2)

1 mole of PbS is oxidised by " X " moles of O_3 to get " Y " moles of O_2. $X + Y =$ _____

Q6 - 2024 (27 Jan Shift 2)

9.3 g of aniline is subjected to reaction with excess of acetic anhydride to prepare acetanilide. The mass of acetanilide produced if the reaction is 100% completed is _____ $\times 10^{-1}$ g. (Given molar mass in $gmol^{-1}$ N : 14, O : 16, C : 12, H : 1)

Q7 - 2024 (30 Jan Shift 1)

0.05 cm thick coating of silver is deposited on a plate of 0.05 m^2 area. The number of silver atoms deposited on plate are _____ $\times 10^{23}$. (At mass Ag = 108, d = 7.9 g cm^{-3})

Q8 - 2024 (31 Jan Shift 1)

Number of moles of methane required to produce 22 g$CO_{2(g)}$ after combustion is $x \times 10^{-2}$ moles. The value of x is

Q9 - 2024 (31 Jan Shift 2)

A sample of $CaCO_3$ and $MgCO_3$ weighed 2.21 g is ignited to constant weight of 1.152 g. The composition of mixture is :

(Given molar mass in gmol^{-1} $CaCO_3$: 100, $MgCO_3$: 84)

(1) 1.187 g$CaCO_3$ + 1.023 g$MgCO_3$

(2) 1.023 g$CaCO_3$ + 1.023 g$MgCO_3$

(3) 1.187 g$CaCO_3$ + 1.187 g$MgCO_3$

(4) 1.023 g$CaCO_3$ + 1.187 g$MgCO_3$

Q10 - 2024 (31 Jan Shift 2)

The molarity of 1 L orthophosphoric acid (H_3PO_4) having 70% purity by weight (specific gravity 1.54 g cm^{-3}) is _____ M.

(Molar mass of H_3PO_4 = 98 g mol^{-1})

Answer Key

Q1 (24) **Q2** (14) **Q3** (8) **Q4** (7)

Q5 (8) **Q6** (135) **Q7** (11) **Q8** (50)

Q9 (1) **Q10** (11)

Q1

Limiting Reagent is $PbCl_2$ mmol of $Pb_3(PO_4)_2$ formed

$$= \frac{\text{mmol of } PbCl_2 \text{ reacted}}{3}$$

$$= 24\text{mmol}$$

Q2

$$\boxed{\begin{matrix}\text{CxHy} \\ 10\text{ml}\end{matrix}} + O_2 \rightarrow CO_2 + H_2O$$

$$\underset{10x}{CxHy} + \left(x + \frac{y}{4}\right) O_2 \rightarrow \underset{}{xCO_2} + \underset{5y}{\frac{y}{2}H_2O}$$

$10x = 40$

$x = 4$

$5y = 50$

$y = 10$

C_4H_{10}

Q3

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

Moles of $CO_2 = \frac{22}{44} = 0.5$

So, required moles of $CH_4 = 0.5$

Mass $= 0.5 \times 16 = 8\text{gm}$

Q4

$$M = \frac{n_{NaOH}}{V_{sol}\ (\text{in L})} \Rightarrow 3 = \frac{(84/40)}{V} \Rightarrow V = 0.7\ \text{L} = 7 \times 10^{-1}\ \text{L}$$

Q5

$PbS + 4O_3 \rightarrow PbSO_4 + 4O_2$

$x = 4, y = 4$

Q6

$$\underset{(\text{Aniline MM}=93)}{C_6H_5NH_2} + CH_3-\overset{O}{\overset{||}{C}}-O-\overset{O}{\overset{||}{C}}-CH_3 \rightarrow$$

$$\underset{(\text{Acetanilide MM}=135)}{C_6H_5NH-\overset{O}{\overset{||}{C}}-CH_3} + CH_3COOH$$

$$n_{\text{Acetanilide}} = n_{\text{Aniline}}$$
$$\Rightarrow \frac{m}{135} = \frac{9.3}{93}$$
$$\Rightarrow m = 13.5\ g$$

Q7

olume of silver coating $= 0.05 \times 0.05 \times 10000 = 25\ cm^3$

Mass of silver deposited $= 25 \times 7.9\ g$

Moles of silver atoms $= \frac{25 \times 7.9}{108}$

Number of silver atoms $= \frac{25 \times 7.9}{108} \times 6.023 \times 10^{23} = 11.01 \times 10^{23}$

Ans. 11

Q8

$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(\ell)}$

$n_{CO_2} = \frac{22}{44} = 0.5$ moles

So moles of CH_4 required $= 0.5$ moles

i.e. 50×10^{-2} mole

$x = 50$

Q9

$CaCO_3(s) \xrightarrow{\Delta} CaO(s) + CO_2(g)$

$MgCO_3(s) \xrightarrow{\Delta} MgO(s) + CO_2(g)$

Let the weight of $CaCO_3$ be xgm

$\therefore$ weight of $MgCO_3 = (2.21 - x)gm$

Moles of $CaCO_3$ decomposed = moles of CaO formed

$\frac{x}{100}$ = moles of CaO formed

$\therefore$ weight of CaO formed = $\frac{x}{100} \times 56$

Moles of $MgCO_3$ decomposed = moles of MgO formed

$\frac{(2.21-x)}{84}$ = moles of MgO formed

$\therefore$ weight of MgO formed = $\frac{2.21-x}{84} \times 40$

$\Rightarrow \frac{2.21-x}{84} \times 40 + \frac{x}{100} \times 56 = 1.152$

$\therefore x = 1.1886$ g = weight of $CaCO_3$

& weight of $MgCO_3 = 1.0214$ g

Q10

Specific gravity (density) = 1.54 g/cc.

Volume = 1 L = 1000ml

Mass of solution = 1.54×1000

= 1540 g

% purity of H_2SO_4 is 70%

So weight of $H_3PO_4 = 0.7 \times 1540 = 1078$ g

Mole of $H_3PO_4 = \frac{1078}{98} = 11$

Molarity = $\frac{11}{1\,L} = 11$