Q1 - 25 July - Shift 2

56.0 L of nitrogen gas is mixed with excess of hydrogen gas and it is found that 20 L of ammonia gas is produced. The volume of unused nitrogen gas is found to be____ L.

Space for your notes:

Q2 - 26 July - Shift 1

Chlorophyll extracted from the crushed green leaves was dissolved in water to make 2 L solution of Mg of concentration 48 ppm. The number of atoms of Mg in this solution is $x \times 10^{20}$ atoms. The value of x is_____. (Nearest Integer)

(Given : Atomic mass of Mg is 24 g mol^{-1}, $N_A = 6.02 \times 10^{23}$ mol^{-1})

Space for your notes:

Q3 - 26 July - Shift 1

When 800 mL of 0.5 M nitric acid is heated in a beaker, its volume is reduced to half and 11.5 g of nitric acid is evaporated. The molarity of the remaining nitric acid solution is $x \times 10^{-2}$ M. (Nearest Integer)

(Molar mass of nitric acid is 63 g mol^{-1})

Space for your notes:

Q4 - 26 July - Shift 2

Hemoglobin contains 0.34% of iron by mass. The number of Fe atoms in 3.3 g of hemoglobin is :

(Given : Atomic mass of Fe is 56 u, N_A in 6.022×10^{23} mol^{-1})

(A) 1.21×10^5 (B) 12.0×10^{16}

(C) 1.21×10^{20} (D) 3.4×10^{22}

Space for your notes:

Q5 - 27 July - Shift 1

250 g solution of D-glucose in water contains 10.8% of carbon by weight. The molality of the solution is nearest to

(Given: Atomic Weights are H, 1u ; C, 12u ; O, 16u)

(A) 1.03 (B) 2.06

(C) 3.09 (D) 5.40

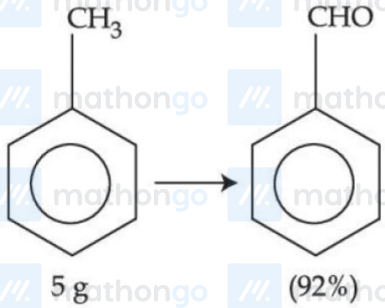
Space for your notes:

Q6 - 27 July - Shift 2

The normality of H_2SO_4 in the solution obtained on mixing 100 mL of 0.1 M H_2SO_4 with 50 mL of 0.1 M NaOH is_____$\times 10^{-1}$ N. (Nearest Integer)

Space for your notes:

Q7 - 27 July - Shift 2



In the above reaction, 5 g of toluene is converted into benzaldehyde with 92% yield. The amount of benzaldehyde produced is_____$\times 10^{-2}$ g. (Nearest integer)

Space for your notes:

Q8 - 28 July - Shift 1

In the given reaction,

$$X + Y + 3Z \rightleftarrows XYZ_3$$

if one mole of each of X and Y with 0.05 mol of Z gives compound XYZ_3. (Given : Atomic masses of X, Y and Z are 10, 20 and 30 amu, respectively). The yield of XYZ_3 is _____ g.

(Nearest integer)

Space for your notes:

Q9 - 28 July - Shift 1

On complete combustion of 0.492 g of an organic compound containing C, H and O, 0.7938 g of CO_2 and 0.4428 g of H_2O was produced. The % composition of oxygen in the compound is _____.

Space for your notes:

Q10 - 29 July - Shift 1

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$$

20 g 5 g

Consider the above reaction, the limiting reagent of the reaction and number of moles of NH_3 formed respectively are:

(A) H_2, 1.42 moles (B) H_2, 0.71 moles

(C) N_2, 1.42 moles (D) N_2, 0.71 moles

Space for your notes:

Q11 - 29 July - Shift 2

Consider the reaction

$4HNO_3(l) + 3KCl(s) \rightarrow Cl_2(g) + NOCl(g) + 2H_2O(g) + 3KNO_3(s)$

The amount of HNO_3 required to produce 110.0 g of KNO_3 is :

(Given : Atomic masses of H, O, N and K are 1, 16, 14 and 39, respectively.)

(A) 32.2 g (B) 69.4 g

(C) 91.5 g (D) 162.5 g

Space for your notes:

Q12 - 29 July - Shift 2

$C(s) + O_2(g) \rightarrow CO_2(g) + 400\ kJ$

$C(s) + \frac{1}{2}O_2(g) \rightarrow CO(g) + 100\ kJ$

When coal of purity 60% is allowed to burn in presence of insufficient oxygen, 60% of carbon is converted into 'CO' and the remaining is converted into 'CO_2'.

The heat generated when 0.6 kg of coal is burnt is _____.

(A) 1600 kJ (B) 3200 kJ

(C) 4400 kJ (D) 6600 kJ

Space for your notes:

Q13 - 29 July - Shift 2

A 1.84 mg sample of polyhydric alcoholic compound 'X' of molar mass 92.0 g/mol gave 1.344 mL of H_2 gas at STP. The number of alcoholic hydrogens present in compound 'X' is____.

Space for your notes:

Answer Key

Q1 (46) **Q2** (24) **Q3** (54) **Q4** (C)

Q5 (B) **Q6** (1) **Q7** (530) **Q8** (2)

Q9 (46) **Q10** (C) **Q11** (C) **Q12** (D)

Q13 (6)

Q1 (46)

$$\begin{array}{ccccc} N_2 & + & 3H_2 & \rightarrow & 2NH_3 \\ 56L & & \text{excess} & & O \\ -10L & & -30L & & +20L \\ \hline 46L & & & & 20L \end{array}$$

Q2 (24)

$$ppm = \frac{W_{Mg}}{V_{soln}} \times 10^6 = 48$$

$$\Rightarrow W_{Mg} = \frac{48 \times 2 \times 1000}{10^6}$$

$$= 48 \times 2 \times 10^{-3}\ g$$

$$n_{Mg} = \frac{W_{Mg}}{24} = \frac{48 \times 2 \times 10^{-3}}{24}$$

$$= 4 \times 10^{-3}$$

$$\text{Number of Mg atoms} = 4 \times 10^{-3} \times 6.02 \times 10^{23}$$

$$= 4 \times 6.02 \times 10^{20}$$

$$= 24.08 \times 10^{20}$$

$$\therefore \quad x = 24.08$$

Q3 (54)

$$n_{HNO_3} = 0.5 \times 0.8$$

$$= 0.4 \text{ mole}$$

$$(n_{HNO_3})_{remains} = 0.4 - \frac{11.5}{63}$$

$$= 0.4 - 0.1825$$

$$= 0.2175$$

$$\text{Molarity} = \frac{0.2175}{400} \times 1000$$

$$= \frac{0.2175}{0.4}$$

$$= 0.5437 \text{ mole/lit.}$$

$$\simeq 0.54 \text{ mole/lit.}$$

$$= 54 \times 10^{-2} \text{ mol/lit.}$$

Q4 (C)

$$\text{No. of Fe atoms} = \frac{0.34}{100} \times \frac{3.3}{56} \times 6.022 \times 10^{23}$$

$$= 1.206 \times 10^{20}$$

Q5 (B)

$C_6H_{12}O_6 \rightarrow$ Glucose

$$\text{We know: } \frac{\text{mass of C}}{\text{mass of glucose}} = \frac{72}{180}$$

$$\text{Given: \%C} = 10.8 = \frac{\text{mass of C}}{\text{mass of solution}} \times 100$$

$$\frac{10.8 \times 250}{100} = \text{mass of C} \Rightarrow \text{Mass of C} = 27 \text{ gm}$$

$\therefore$ mass of glucose = 67.5 gm

$\therefore$ moles of glucose = 0.375 moles

Mass of solvent = 250 – 67.5 gm = 182.5 gm

$$\therefore \text{ Molality} = \frac{0.375}{0.1825} = 2.055 \approx 2.06$$

Q6 (1)

No. of equivalents of $H_2SO_4 = 100 \times 0.1 \times 2 = 20$

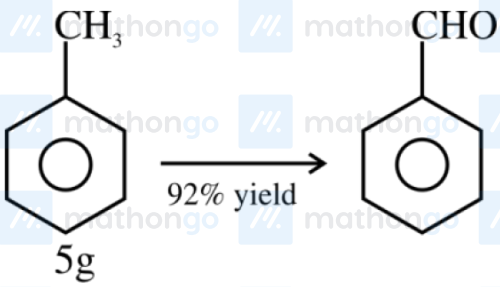
No. of equivalents of $NaOH = 50 \times 0.1 = 5$

No. of equivalents of H_2SO_4 left = 20 – 5 = 15

$$\Rightarrow 150 \times x = 15$$

$$x = \frac{1}{10} = 0.1\text{N} = 1 \times 10^{-1}\text{ N}$$

Q7 (530)



$$\text{moles} = \frac{5}{92}$$

$$\text{moles of } \text{C}_6\text{H}_5\text{CHO} = \frac{5}{92} \times \frac{92}{100} = 5 \times 10^{-2}$$

$$\text{mass of } \text{C}_6\text{H}_5\text{CHO} = 106 \times 5 \times 10^{-2} = 5.3 \text{ g}$$

$$= 530 \times 10^{-2} \text{ g}$$

Q8 (2)

$$\underset{1\text{mol}}{X} + \underset{1\text{mol}}{Y} + \underset{0.05\text{mol}}{3Z} \rightleftharpoons \mathbf{XYZ_3}$$

Z is L.R.

$$\frac{0.05}{3} = 1 \text{ mole of } XYZ_3$$

$$\text{Mass of } XYZ_3 = \frac{0.05}{3} \times (10 + 20 + 30 \times 3)$$

$$= 2\text{g}$$

Q9 (46)

$0.492g$ of $C_xH_yO_z$

Gives 0.7938 g $CO_2 = 0.018$ moles

$0.4428g\ H_2O = 0.0246$ moles

So moles of $C = 0.018 \Rightarrow 0.216$ g

Moles of $H = 0.049 \Rightarrow 0.049g$

$\therefore$ wt. of Oxygen $= 0.492 - 0.216 - 0.049$

$= 0.227g$

$$\% \text{ of Oxygen} = \frac{0.227}{0.492} \times 100 \quad 46 \text{ (approx.)}$$

Q10 (C)

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

$W_2 = 20g \qquad 5g.$

$$n = \frac{20}{28} \qquad \frac{5}{2}$$

Stoichiometric Amount:

$$N_2 \rightarrow \frac{20/28}{1} = \frac{20}{28} \qquad H_2 \rightarrow \frac{5/2}{3} = \frac{5}{6}$$

$\therefore$ N_2 is the Limiting Reagent.

$$\therefore \quad n(NH_3) = 2 \times n(N_2) = 2 \times \frac{20}{28}$$

$= 1.42$

Q11 (C)

$$4HNO_3(\ell) + 3KCl(s) \rightarrow Cl_2(g) + NOCl(g) + 2H_2O(g) + 3KNO_3(g)$$

x gm **110 gm**

$$\frac{x}{63} \qquad \text{Mole} = \frac{110}{101}$$

$$4 \rightarrow 3$$

$$1 \rightarrow \frac{3}{4}$$

$$\frac{x}{63} \rightarrow \frac{3}{4} \times \frac{x}{63} = \frac{110}{101}$$

$$x = \frac{110 \times 63 \times 4}{101 \times 3} = 91.5\,gm$$

Q12 (D)

$C(S) + O_2(g) \rightarrow CO_2(g) + 400\ kJ$

1 g mole

$C(s) + \frac{1}{2}O_2(g) \rightarrow CO(g) + 100kJ \quad \ldots. (II)$

0.6×1000

$= 600\ gm$

$600 \times \frac{60}{100}$ (Pure Carbon)

$= 360gm = \frac{360}{12} = 30mole$ (Pure Carbon)

Carbon converted into $CO_2 = \left(30 - 30 \times \frac{60}{100}\right)$

$= 12$ mole

and carbon converted in $CO = 30 \times \frac{60}{100} = 18mole$

Energy generated during II equation

$= 18 \times 100$

$= 1800$ kJ

Energy generated during I^{st} reaction.

$= 12 \times 400$

$= 4800$

Total = 1800 + 4800 = 6600 kJ

Q13 (6)

$$R(OH)_x \rightarrow H_2$$

PoAC on H –

$$x\left(\frac{1.84\times10^{-3}}{92}\right)=\frac{1.344}{22.4}\times2$$

$$x=\frac{1.344\times2\times92\times1000}{1.84\times22400}=6$$

$$x=6$$