

Questions

MathonGo

Q1 - 24 June - Shift 1

If a rocket runs on a fuel ($C_{15}H_{30}$) and liquid oxygen, the weight of oxygen required and CO_2 released for every litre of fuel respectively are:

(Given: density of the fuel is 0.756 g/mL)

- (A) 1188 g and 1296 g (B) 2376 g and 2592 g
(C) 2592g and 2376 g (D) 3429 g and 3142 g

Space for your notes:

Q2 - 24 June - Shift 2

120 of an organic compound that contains only carbon and hydrogen gives 330g of CO_2 and 270g of water on complete combustion. The percentage of carbon and hydrogen, respectively are.

- (A) 25 and 75 (B) 40 and 60
(C) 60 and 40 (D) 75 and 25

Space for your notes:

Q3 - 25 June - Shift 1

The number of N atoms is 681 g of $C_7H_5N_3O_6$ is $x \times 10^{21}$. The value of x is _____ ($N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$) (Nearest Integer)

Space for your notes:

Q4 - 25 June - Shift 2

A protein 'A' contains 0.30% of glycine (molecular weight 75). The minimum molar mass of the protein 'A' is _____ $\times 10^3 \text{ g mol}^{-1}$ [nearest integer]

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Q5 - 26 June - Shift 1

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A commercially sold conc. HCl is 35% HCl by mass. If the density of this commercial acid is 1.46 g/mL, the molarity of this solution is :

(Atomic mass : Cl = 35.5 amu, H = 1 amu)

- (A) 10.2 M (B) 12.5 M
(C) 14.0 M (D) 18.2 M

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Q6 - 26 June - Shift 1

On complete combustion 0.30 g of an organic compound gave 0.20 g of carbon dioxide and 0.10 g of water. The percentage of carbon in the given organic compound is _____ (Nearest Integer)

Space for your notes:

Q7 - 26 June - Shift 2

The moles of methane required to produce 81 g of water after complete combustion is _____ $\times 10^{-2}$ mol. [nearest integer]

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Q8 - 27 June - Shift 2

116 g of a substance upon dissociation reaction, yields 7.5 g of hydrogen, 60g of oxygen and 48.5 g of carbon. Given that the atomic masses of H, O and C are 1, 16 and 12 respectively. The data agrees with how many formulae of the following?

- (A) CH_3COOH (B) HCHO
(C) CH_3OOCH_3 (D) CH_3CHO

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Q9 - 28 June - Shift 2

Compound A contains 8.7% Hydrogen, 74% Carbon and 17.3% Nitrogen. The molecular formula of the compound is,

Given : Atomic masses of C, H and N are 12, 1 and 14 amu respectively.

The molar mass of the compound A is 162 g mol^{-1} .

- (A) $\text{C}_4\text{H}_6\text{N}_2$ (B) $\text{C}_2\text{H}_3\text{N}$
(C) $\text{C}_5\text{H}_7\text{N}$ (D) $\text{C}_{10}\text{H}_{14}\text{N}_2$

Space for your notes:

Q10 - 28 June - Shift 2

The complete combustion of 0.492 g of an organic compound containing 'C', 'H' and 'O' gives 0.793g of CO_2 and 0.442 g of H_2O . The percentage of oxygen composition in the organic compound is _____ . (nearest integer)

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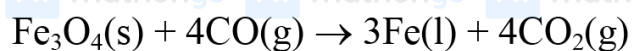
Q11 - 29 June - Shift 1

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Production of iron in blast furnace follows the following equation



when 4.640 kg of Fe_3O_4 and 2.520 kg of CO are allowed to react then the amount of iron (in g) produced is :

[Given : Molar Atomic mass (g mol^{-1}): Fe = 56

Molar Atomic mass (g mol^{-1}): O = 16

Molar Atomic mass (g mol^{-1}): C = 12

(A) 1400 (B) 2200

(C) 3360 (D) 4200

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Q12 - 29 June - Shift 1

Geraniol, a volatile organic compound, is a component of rose oil. The density of the vapour is 0.46 gL^{-1} at 257°C and 100 mm Hg. The molar mass of geraniol is _____ (Nearest Integer)

[Given R = $0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$]

Space for your notes:

Q13 - 29 June - Shift 2

Using the rules for significant figures, the correct answer for the expression $\frac{0.02858 \times 0.112}{0.5702}$ will be:

(A) 0.005613 (B) 0.00561

(C) 0.0056 (D) 0.006

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Answer Key

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Q1 (C)**Q2 (D)****Q3 (5418)****Q4 (25)**

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Q5 (C)**Q6 (18)****Q7 (225)****Q8 (2)**

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Q9 (D)**Q10 (46)****Q11 (C)****Q12 (152)**

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Q13 (B)

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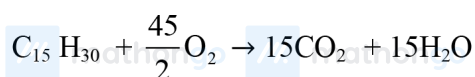
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Hints and Solutions

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Q1 (C)

$$\text{Mass of fuel} = 0.756 \times 1000 \text{ g}$$

$$\text{No. of moles of fuel} = \frac{0.756 \times 1000}{210}$$

$$\text{Wt. of oxygen} = \frac{0.756 \times 1000}{210} \times \frac{45}{2} \times 32 = 2592 \text{ g}$$

$$\text{Wt of } CO_2 = \frac{0.756 \times 1000}{210} \times 15 \times 44 = 2376 \text{ g}$$

Q2 (D)

Given mass of organic compound = 120

mass of $CO_2(g)$ = 330 gmass of $H_2O(l)$ = 270 gmass of carbon = $n_{CO_2} \times 12$

$$= \frac{330}{44} \times 12 = 90 \text{ g}$$

$$\% \text{ of carbon} = \frac{90}{120} \times 100 = 75\%$$

mass of hydrogen = $n_{H_2O} \times 2$

$$= \frac{270}{18} \times 2 = 30 \text{ g}$$

$$\% \text{ of hydrogen} = \frac{30}{120} \times 100 = 25\%$$

Q3 (5418)

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Hints and Solutions

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M.M. of $C_7H_5N_3O_6$ is $84 + 5 + 42 + 96 = 227$

$$n_{C_7H_5N_3O_6} = \frac{681}{227} = 3$$

$$n_N = \frac{681}{227} \times 3 = 9 \text{ mol}$$

$$\text{no. of N atoms} = 9 \times 6.02 \times 10^{23}$$

$$= 5418 \times 10^{21}$$

\therefore The answer is 5418.

Q4 (25)

0.30% glycine is equal to 75

$$1\% \longrightarrow \frac{75}{0.30}$$

$$100\% \longrightarrow \frac{75}{0.30} \times 100$$

$$= 25000 \text{ g}$$

Q5 (C)

Let total volume = 1000 mL = 1L

total mass of solution = 1460 g

$$\text{mass of HCl} = \frac{35}{100} \times 1460$$

$$\text{moles of HCl} = \frac{35 \times 1460}{100 \times 36.5}$$

$$\text{So molarity} = \frac{35 \times 1460}{100 \times 36.5} = 14M$$

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Hints and Solutions

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Q6 (18)



$$\frac{0.3g}{n_{CO_2}} = \frac{x}{\frac{0.2g}{44}} = \frac{0.2/44}{\frac{.1g}{18}}$$

$$\frac{2x}{y} = \frac{36}{44} = \frac{9}{11}$$

$$x = \frac{9y}{22}$$

$$\frac{n_{C_xH_yO_z}}{n_{CO_2}} = \frac{1}{x}$$

$$\frac{0.3}{12x + y + 16z} \times \frac{44}{0.2} = \frac{1}{x}$$

$$66x = 12x + y + 16z$$

$$54x = y + 16z$$

$$\frac{54 \times 9y}{22} - y = 16z$$

$$\frac{464y}{22} = 16z$$

$$z = \frac{29y}{22}$$

$$C_xH_yO_z = C_xH_yO_z$$

$$C_{\frac{9y}{22}}H_yO_{\frac{29y}{22}}$$

$$C_9H_{22}O_{29}$$

$$\% \text{ of C} = \frac{12 \times 9}{(12 \times 9 + 22 + 29 \times 16)} \times 100 = \frac{108}{594} \times 100$$

$$18.18\%$$

Q7 (225)

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POAC on H atom

$$n_{\text{CH}_4} \times 4 = n_{\text{H}_2\text{O}} \times 2$$

$$n_{\text{CH}_4} = \frac{81}{18} \times 2 \times \frac{1}{4} = \frac{81}{36}$$

$$n_{\text{CH}_4} = 2.25$$

$$= 225 \times 10^{-2}$$

Nearest Integers = 225

Q8 (2)

$$\% \text{H} = \frac{7.5}{116} \times 100 = 6.5$$

$$\% \text{O} = \frac{60}{116} \times 100 = 51.7$$

$$\% \text{C} = \frac{48.5}{116} \times 100 = 41.8$$

Relative atomicities = H \Rightarrow 6.5

$$\text{O} \Rightarrow \frac{51.7}{16} = 3.25$$

$$\text{C} \Rightarrow \frac{41.8}{12} = 3.5$$

Empirical formula is approx.. CH_2O

(A) $\text{C}_2\text{H}_4\text{O}_2$ (B) CH_2O relate to this formula.

Q9 (D)

Hints and Solutions

MathonGo

C	74%	$\frac{74}{12} = 6.16$	$\frac{6.16}{1.23} = 5$
N	17.3%	$\frac{17.3}{14} = 1.23$	$\frac{1.23}{1.23} = 1$
H	8.7%	$\frac{8.7}{1} = 8.7$	$\frac{8.7}{1.23} = 7$

Empirical formula = C_5NH_7

Empirical weight = 81

Multiplying factor = $\frac{162}{81} = 2$ Molecular formula = $C_{10}N_2H_{14}$ **Q10 (46)**Mole of CO_2 = Moles of C = $\frac{0.793}{44}$ Weight of 'C' = $\frac{0.793}{44} \times 12 = 0.216$ gmMoles of 'H' = $\frac{0.442}{18} \times 2$ Weight of 'H' = $\frac{0.442}{18} \times 2 \times 1 = 0.049$ gm \therefore Weight of 'O' = $0.492 - 0.216 - 0.049 = 0.227$ gm% of 'O' = $\frac{0.227}{0.492} \times 100 = 46.13\%$

46

Q11 (C)

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Hints and Solutions

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$$\text{Moles of Fe}_3\text{O}_4 = \frac{4.640 \times 10^3}{232} = 20$$

$$\text{Moles of CO} = \frac{2.52 \times 10^3}{28} = 90$$

So limiting Reagent = Fe_3O_4

So moles of Fe formed = 60

$$\text{Weight of Fe} = 60 \times 56 = 3360 \text{ gms}$$

Q12 (152)

Assuming ideal behaviour $P = \frac{dRT}{M}$

$$P = \frac{100}{760} \text{ atm}, T = 257 + 273 = 530 \text{ K}$$

$$d = 0.46 \text{ gm/L}$$

$$\text{So } M = \frac{0.46 \times 0.082 \times 530}{100} \times 760$$

$$= 151.93 \approx 152$$

Q13 (B)

Reported answer should not be more precise than least precise term in calculations, so there should be three significant figures in reported answer.

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