Some Basic Concepts Of Chemistry

Question1

The amount of glucose required to prepare 250 mL of M/20 aqueous solution is :

(Molar mass of glucose : $180 g mol^{-1}$)

[NEET 2024 Re]

Options:

A.

2.25 g

B.

4.5 g

C.

0.44 g

D.

1.125 g

Answer: A

Solution:

$$\text{Molarity, } M = \frac{w_2 \times 1000}{M_2 \times (V)}$$

$w_2 =$ Amount of glucose

$$\text{Given molarity} = \frac{M}{20}$$

$$\frac{1}{20} = \frac{w_2 \times 1000}{180 \times 250}$$

$$w_2 = \frac{180 \times 250}{20 \times 1000}$$

$$= 2.25 g$$

Question2

1.0 g of H_2 has same number of molecules as in:

[NEET 2024 Re]

Options:

A.

14 g of N_2

B.

18 g of H_2O

C.

16 g of CO

D.

28 g of N_2

Answer: A

Solution:

Number of moles of $H_2 = \frac{1}{2} = 0.5$

Number of molecules of $H_2 = 0.5N_A$.

(1) Number of moles of $N_2 = \frac{14}{28} = 0.5$

Number of molecules of $N_2 = 0.5N_A$

(2) Number of moles of $H_2O = \frac{18}{18} = 1$

Number of molecules of $H_2O = 1 \times N_A = N_A$

(3) Number of moles of CO $= \frac{16}{28} = \frac{4}{7}$

Number of molecules of CO $= \frac{4}{7}N_A$

(4) Number of moles of $N_2 = \frac{28}{28} = 1$

Number of molecules of $N_2 = 1 \times N_A = N_A$

Question3

On complete combustion, 0.3 g of an organic compound gave 0.2 g of CO_2 and 0.1 g of H_2O. The percentage composition of carbon and hydrogen in the compound, respectively is:

[NEET 2024 Re]

Options:

A.

4.07% and 15.02%

B.

18.18% and 3.70%

C.

15.02% and 4.07%

D.

3.70% and 18.18%

Answer: B

Solution:

$$\text{Percentage of carbon} = \frac{12 \times m_2 \times 100}{44 \times m}$$

$m =$ mass of organic compound $= 0.3g$

$m_2 =$ mass of carbon dioxide $= 0.2g$

$$\therefore \%C = \frac{12 \times 0.2 \times 100}{44 \times 0.3} = 18.18\%$$

$$\text{Percentage of hydrogen} = \frac{2 \times m_1 \times 100}{18 \times m}$$

$m_1 =$ mass of water $= 0.1g$

$$\therefore \%H = \frac{2 \times 0.1 \times 100}{18 \times 0.3} = 3.70\%$$

Question4

1 gram of sodium hydroxide was treated with 25 mL of 0.75 MHCl solution, the mass of sodium hydroxide left unreacted is equal to

[NEET 2024]

Options:

A.

750 mg

B.

250 mg

C.

Zero mg

D.

200 mg

Answer: B

Solution:

$$M = \frac{W \times 1000}{M_2 \times V(\text{ in mL})}$$

$$W = \frac{M \times M_2 \times V(\text{ in mL})}{1000} = \frac{0.75 \times 36.5 \times 25}{1000}$$

$$= 0.684\text{g}(\text{ Mass of HCl})$$

$$\underset{36.5\text{g}}{\text{HCl}} + \underset{40\text{g}}{\text{NaOH}} \rightarrow \text{HCl} + \text{NaOH}$$

36.5g HCl reacts with NaOH = 40g

0.684g HCl reacts with NaOH $= \frac{40}{36.5} \times 0.684 \approx 0.750\text{g}$

Amount of NaOH left $= 1\text{g} - 0.750\text{g} = 0.250\text{g} = 250\,\text{mg}$

Question5

The highest number of helium atoms is in

[NEET 2024]

Options:

A.

4 mol of helium

B.

4u of helium

C.

4g of helium

D.

2.271098L of helium at STP

Answer: A

Solution:

(1) 4 mol of He = 4 NA He atoms

(2) 4u of He $= \frac{4\text{u}}{4\text{u}} = 1$ He atom

(3) 4g of Helium $= \frac{4\text{g}}{4\text{g}}$ mole $= 1$ mole $= N_A$ He atom

(4) 2.2710982 of He at STP $= \frac{2.271}{22.710982}$ mole

$= 0.1$ mole

$= 0.1N_A$ He atom

Question6

A compound X contains 32% of A,20% of B and remaining percentage of C. Then, the empirical formula of X is :

(Given atomic masses of A = 64 ; B = 40 ; C = 32u)

[NEET 2024]

Options:

A.

A_2BC_2

B.

ABC_3

C.

AB_2C_2

D.

ABC_4

Answer: B

Solution:

Element	Masspercentage %	No. of moles	No. of moles/Smallest number	Simplest whole number
A	32%	$\frac{32}{64}=\frac{1}{2}$	$\frac{1}{2}\times 2$	$=1$
B	20%	$\frac{20}{40}=\frac{1}{2}$	$\frac{1}{2}\times 2$	$=1$
C	48%	$\frac{48}{32}=\frac{3}{2}$	$\frac{3}{2}\times 2$	$=3$

So, empirical formula of X = $\begin{matrix} A & : & B & : & C \\ 1 & : & 1 & : & 3 \end{matrix}$

∴ The correct empirical formula of compound X is ABC_3

Question7

The right option for the mass of CO_2 produced by heating 20g of 20% pure limestone is (Atomic mass of

$Ca = 40)\left[CaCO_3 \xrightarrow{1200K} CaO + CO_2\right]$

[NEET 2023]

Options:

A.

1.76g

B.

2.64g

C.

1.32g

D.

1.12g

Answer: A

Solution:

$CaCO_3 \xrightarrow{1200K} CaO + CO_2$

From $100gCaCO_3 \rightarrow 44gCO_2$ produced

As $CaCO_3$ is 20% pure

So, mass of pure $CaCO_3 = 20 \times \frac{20}{100} = 4g$

So, $100gCaCO_3 \rightarrow 44gCO_2$

$4gCaCO_3 \rightarrow \frac{44}{100} \times 4gCO_2$

$= 1.76gCO_2$

Question8

The density of 1M solution of a compound ' X ' is $1.25gmL^{-1}$. The correct option for the molality of solution is (Molar mass of compound X = 85g) :

[NEET 2023 mpr]

Options:

A.

0.705m

B.

1.208m

C.

1.165m

D.

0.858m

Answer: D

Solution:

$$m = \frac{1000 \times M}{1000 \times d - MM_w}$$

$$m = \frac{1000 \times 1}{1000 \times 1.25 - 1 \times 85}$$

$$m = \frac{1000}{1165} = 0.858$$

Question9

What mass of 95% pure $CaCO_3$ will be required to neutralise 50mL of 0.5M H Cl solution according to the following reaction?
$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + 2H_2O_{(l)}$
[Calculate upto second place of decimal point]
[NEET-2022]

Options:

A. 1.25g

B. 1.32g

C. 3.65g

D. 9.50g

Answer: B

Solution:

Solution:

Let m gram mass of $CaCO_3$ is required

Pure $CaCO_3$ in m gram $= \frac{95}{100} \times m$

Moles of $CaCO_3 = \frac{95}{100} \times \frac{m}{100}$

Moles of HCl required $= 2 \times$ moles of $CaCO_3$

$= 2 \times \frac{95}{100} \times \frac{m}{100}$

$2 \times \frac{95}{100} \times \frac{m}{100} = \frac{50}{1000} \times 0.5$

$m = 1.315g \approx 1.32g$

Question10

An organic compound contains 78% (by wt.) carbon and remaining percentage of hydrogen. The right option for the empirical formula of this compound is : [Atomic wt. of C is 12, H is 1]
[NEET 2021]

Options:

A. CH

B. CH_2

C. CH_3

D. CH_4

Answer: C

Solution:

Solution:

Element	Mass percentage	No . of mole	Mole ratio
C	78%	$\frac{78}{12} = 6.5$	$\frac{6.5}{6.5} = 1$
H	22%	$\frac{22}{1} = 22$	$\frac{22}{6.5} = 3.38 \simeq = 3$

Based on above calculation, possible empiricalformula is CH_3 .

Question11

Which one of the followings has maximum number of atoms ?
[2020]

Options:

A. 1 g of Mg(s) [Atomic mass of Mg = 24]

B. 1 g of O_2 [Atomic mass of O = 16]

C. 1 g of Li(s) [Atomic mass of Li = 7]

D. 1 g of Ag(s) [Atomic mass of Ag = 108]

Answer: C

Solution:

Number of atoms $= \frac{W}{\text{Molar mass}} \times N_A \times$ atomicity

(a) Number of Mg atoms $= \frac{1}{24} \times N_A \times 1$

(b) Number of O atoms $= \frac{1}{32} \times N_A \times 2$

(c) Number of Li atoms $= \frac{1}{7} \times N_A \times 1$

(d) Number of Ag atoms $= \frac{1}{108} \times N_A \times 1$

Question12

The number of moles of hydrogen molecules required to produce 20 moles of ammonia through Haber's process is
(NEET 2019)

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Options:

A. 40

B. 10

C. 20

D. 30

Answer: D

Solution:

Solution:
Haber's process $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
20 moles needs to be produced
2 moles $NH_3 \rightarrow$ 3 moles of H_2
Hence 20 moles of $NH_3 \rightarrow \frac{3 \times 20}{2} = 30$ of moles of H_2

Question13

The density of 2M aqueous solution of NaOH is 1.28g/cm^3. The molality of the solution is [Given that molecular mass of NaOH = 40gmol^{-1}]
(Odisha NEET 2019)

Options:

A. 1.20m

B. 1.56m

C. 1.67m

D. 1.32m

Answer: C

Solution:

Density $= 1.28\mathrm{g/cc}$
Conc. of solution $= 2\mathrm{M}$
Molar mass of $NaOH = 40\mathrm{gmol}^{-1}$
Volume of solution $= 1\mathrm{L} = 1000\mathrm{mL}$
Mass of solution $= d \times V = 1280\mathrm{g}$
Mass of solute $= n \times$ Molar mass $= 2 \times 40 = 80\mathrm{g}$
Mass of solvent $= (1280 - 80)\mathrm{g} = 1200\mathrm{g}$
Number of moles of solute $= \frac{80}{40} = 2$
$\therefore$ Molality $= \frac{2 \times 1000}{1200} = 1.67\mathrm{m}$

Question14

A mixture of 2.3g formic acid and 4.5g oxalic acid is treated with conc. H_2SO_4. The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be
(NEET 2018)

Options:

A. 1.4

B. 3.0

C. 2.8

D. 4.4

Answer: C

Solution:

$$H\,COOH \xrightarrow[\text{conc. } H_2SO_4]{\text{Dehydrating agent}} CO + H_2O$$

$n_i = \frac{2.3}{46} = \frac{1}{20}$ 0 0

$n_f = 0$ $\frac{1}{20}$ $\frac{1}{20}$

$$H_2C_2O_4 \xrightarrow{\text{conc. } H_2SO_4} CO + CO_2 + H_2O$$

$n_i = \frac{4.5}{90} = \frac{1}{20}$ 0 0 0

$n_f = 0$ $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$

H_2O absorbed by H_2SO_4. Gaseous mixture (containing CO and CO_2) when passed through KOH pellets, CO_2 gets absorbed.

Moles of CO left (unabsorbed) $= \frac{1}{20} + \frac{1}{20} = \frac{1}{10}$

Mass of CO = moles × molar mass $= \frac{1}{10} \times 28 = 2.8g$

Question15

In which case is number of molecules of water maximum? (NEET 2018)

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Options:

A. 18mL of water

B. 0.18 g of water

C. 0.00224L of water vapours at 1 atm and 273K

D. 10^{-3} mol of water

Answer: A

Solution:

(a) Mass of water $= V \times d = 18 \times 1 = 18g$

Molecules of water = mole $\times N_A = \frac{18}{18} N_A = N_A$

(b) Molecules of water = mole $\times N_A = \frac{0.18}{18} N_A$

$= 10^{-2} N_A$

(c) Moles of water $= \frac{0.00224}{22.4} = 10^{-4}$

Molecules of water = mole $\times N_A = 10^{-4} N_A$

(d) Molecules of water = mole $\times N_A = 10^{-3} N_A$

Question16

Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2. When 0.1 mole of XY_2 weighs 10g and 0.05mole of X_3Y_2 weighs 9g, the atomic weights of X and Y are
(NEET-II 2016)

Options:

A. 40,30

B. 60,40

C. 20,30

D. 30,20

Answer: A

Solution:

Solution:
Let atomic weight of element X is x and that of element Y is y.

For XY_2, $n = \frac{w}{\text{Mol. wt.}}$

$0.1 = \frac{10}{x + 2y} \Rightarrow x + 2y = \frac{10}{0.1} = 100 \ldots(i)$

For X_3Y_2, $n = \frac{w}{\text{Mol. wt.}}$

$0.05 = \frac{9}{3x + 2y} \Rightarrow 3x + 2y = \frac{9}{0.05} = 180 \ldots.(ii)$

On solving equations (i) and (ii), we get $y = 30$

$x + 2(30) = 100 \Rightarrow x = 100 - 60 = 40$

Question17

The number of water molecules is maximum in
(2015)

Options:

A. 1.8 gram of water

B. 18 gram of water

C. 18 moles of water

D. 18 molecules of water

Answer: C

Solution:

1.8 gram of water $= \frac{6.023 \times 10^{23}}{18} \times 1.8$
$= 6.023 \times 10^{22}$ molecules
18 grams of water $= 6.023 \times 10^{23}$ molecules
18 moles of water $= 18 \times 6.023 \times 10^{23}$ molecules

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Question18

If Avogadro number N_A, is changed from $6.022 \times 10^{23} mol^{-1}$ to $6.022 \times 10^{20} mol^{-1}$, this would change (2015)

Options:

A. the mass of one mole of carbon

B. the ratio of chemical species to each other in a balanced equation

C. the ratio of elements to each other in a compound

D. the definition of mass in units of grams

Answer: A

Solution:

Solution:
Mass of 1 mol (6.022×10^{20} atoms) of carbon = 12g
If Avogadro number is changed to 6.022×10^{20} atoms then
mass of 1 mol of carbon $= \frac{12 \times 6.022 \times 10^{20}}{6.022 \times 10^{23}} = 12 \times 10^{-3}$ g

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Question19

What is the mass of the precipitate formed when 50 mL. of 16.9 % solution of $AgNO_3$ is mixed with 50 mL of 5.8% NaCl solution ? (Ag = 107.8, N = 14, O = 16, Na = 23 , Cl = 35.5) (2015)

Options:

A. 3.5 g

B. 7 g

C. 14 g

D. 28 g

Answer: B

Solution:

Solution:
16.9% solution of $AgNO_3$ means 16.9g of $AgNO_3$ in 100 mL of solution.
16.9 g of $AgNO_3$ in 100 mL solution = 8.45 g of $AgNO_3$ in 50 mL solution.
Similarly, 5.8% of NaCl in 100 mL solution =2.9 g of NaCl in 50 mL solution.
The reaction can be represented as:

	$AgNO_3$ +	$NaCl$ -------->	$AgCl$ +	$NaNO_3$
Initially mole	8.45/170 = 0.049 mol	2.9/58.5 =0.049 mol	0	0
Finally	0	0	0.049	0.049

$\therefore$ Mass of AgCl precipitated $= 0.049 \times 143.3$
$-7.02 \approx 7g$

Question20

A mixtures of gases contains H_2 and O_2 gases in the ratio of 1 : 4 (w/w),What is the ratio of the two gases in the mixture ?
(2015 Cancelled)

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Options:

A. 16 : 1

B. 2 : 1

C. 1 : 4

D. 4 : 1

Answer: D

Solution:

Solution:
Number of moles $H_2 - \frac{1}{2}$

Number of moles of $O_2 = \frac{4}{32}$

Hence, molar ratio $= \frac{1}{2} : \frac{4}{32} = 4 : 1$

Question21

1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much ?
(At. wt. Mg = 24,O =16)
(2014)

Options:

A. Mg, 0.16 g

B. O_2, 0.16 g

C. Mg, 0.44 g

D. O_2, 0.28 g

Answer: A

Solution:

Solution:
Given Data, 1.0g of magnesium is burnt with $0.56gO_2$
We know, the balanced chemical reaction of the above phenomena is as follows:
$Mg + \frac{1}{2}O_2 \rightarrow MgO$
We calculate the number of moles of each of the reactants is required, it is given by the formula Number of moles of a substance $= \frac{\text{Mass given}}{\text{Relative formula mass}}$.
The formula mass of Mg and O_2 are 24 and 32 moles respectively as per the chemical properties of magnesium and oxygen. Hence, the number of moles of Mg and O_2 are $\frac{1.0}{24}$ and $\frac{0.56}{32}$, i.e. $\frac{0.5}{12}$ and $\frac{0.07}{4}$ respectively.
Let us assume 'x' moles of Mg is used up to form MgO, i.e. from the balanced equation, x moles of Magnesium is reacted with $\frac{x}{2}$ moles of Oxygen to form x moles of Magnesium Oxide.
Hence after the reaction is over, the remaining amount of Magnesium Mg is $\frac{0.5}{12} - x$ moles and the remaining amount of oxygen is $\frac{0.07}{4} - \frac{x}{2}$ moles.
But in this chemical reaction, oxygen is the limiting reagent, i.e. the reaction goes on until oxygen is available. The reaction only ends after all the oxygen available is over. Hence the number of moles of left over oxygen must be equal to zero, $\frac{0.07}{4} - \frac{x}{2} = 0 \Rightarrow x = \frac{0.07}{2}$
Therefore the number of moles of magnesium left over is $\frac{0.5}{12} - x \Rightarrow \frac{0.5}{12} - \frac{0.07}{2} = \frac{1 - 0.07 \times 12}{24}$ moles $\Rightarrow \frac{0.16}{24}$ moles
Hence the mass of magnesium leftover $= 0.16g$
Thus, when 1.0g of magnesium is burnt with $0.56gO_2$ in a closed vessel, 0.16g magnesium is left in excess.

Question22

When 22.4 liters of $H_2(g)$ is mixed with 11.2 liters of $Cl_2(g)$,each at S.T.P, the moles of $HCl(g)$ formed is equal to (2014)

Options:

A. 1 mol of $HCl_{(g)}$

B. 2 mol of $HCl_{(g)}$

C. 0.5 mol of $HCl_{(g)}$

D. 1.5 mol of $HCl_{(g)}$

Answer: A

Solution:

Solution:
1 mole = 22.4 litres at S.T.P.
$^{n}H_2 = \frac{22.4}{22.4} - 1mol, ^{n}Cl_2 = \frac{11.2}{22.4} - 0.5mol$
Reaction is as

	$H_{2(g)}$ +	$Cl_{2(g)}$ ———	$2HCl_{(g)}$
Initial	1mol	0.5mol	0
Final	$(1 - 0.5)$ = 0.5 mol	$(0.5 - 0.5)$ = 0 mol	2×0.5 1 mol

Here, Cl_2 is limiting reagent. So, 1 mole of HCl (g) is formed

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Question23

Equal masses of H_2, O_2 and methane have been taken in a container of volume V at temperature 27°C in identical conditions. The ratio of the volumes of gases $H_2 : O_2$: methane would be (2014)

Options:

A. 8 : 16 : 1

B. 16 : 8 : 1

C. 16 : 1 : 2

D. 8 : 1 : 2

Answer: C

Solution:

Solution:
According to Avogadro's hypothesis, ration of the volumes of gases will be equal will be equal to the ratio of their no. of moles.
So, no. of mole s = $\frac{\text{Mass}}{\text{Mol. mass}}$
$^{n}H_2 = \frac{w}{2}; n_{O_2} = \frac{w}{32}; ^{n}CH_4 = \frac{w}{16}$
So, the ratio is $\frac{w}{2} : \frac{w}{32} : \frac{w}{16}$ or $16 : 1 : 2$

Question24

6.02×10^{20} molecules of urea are present in 100 mL of its solution. The concentration of solution is

(2013 NEET)

Options:

A. 0.001 M

B. 0.1 M

C. 0.02 M

D. 0.01 M

Answer: D

Solution:

Solution:
Molarity (M) = (Number of solute)\/(volume of solution in litres)
where in
It is defined as the number of moles of the solute in 1 litre of the solution.
No. of molecules (given) $= 6.02 \times 10^{20}$

$$\text{No. of moles} = \frac{6.02 \times 10^{20}}{6.02 \times 10^{23}} = 10^{-3} \text{ mol}$$

Volume of solution=100 ml $= 0.1\text{L}$

Therefore, Molarity $= \frac{\text{no. of moles}}{\text{volume}}$

$$\frac{10^{-3}}{0.1} = 0.01\text{M}$$

Question25

In an experiment it showed that 10mL of 0.05M solution of chloride required 10mL of 0.1M solution of $AgNO_3$, which of the following will be the formula of the chloride (X stands for the symbol of the element other than chlorine)?
(Karnataka NEET 2013)

Options:

A. X_2Cl_2

B. XCl_2

C. XCl_4

D. X_2Cl

Answer: B

Solution:

Millimoles of solution of chloride
$= 0.05 \times 10 = 0.5$
Millimoles of $AgNO_3$ solution $= 10 \times 0.1 = 1$
So, the millimoles of $AgNO_3$ are double than the chloride solution.
$\therefore XCl_2 + 2AgNO_3 \rightarrow 2AgCl + X(NO_3)_2$

Question26

Which has the maximum number of molecules among the following ? (2011 Mains)

Options:

A. 44 g CO_2

B. 48 g O_3

C. 8 g H_2

D. 64 g SO_2

Answer: C

Solution:

Solution:
$8gH_2$ has 4 moles while the others has 1 mole each

Question27

25.3 g of sodium carbonate Na_2CO_3 is dissolved in enough water to make 250 mL of solution. If sodium carbonate dissociates completely, molar concentration of sodium ion, Na^+ and carbonate ions,CO_3^{2-} are respectively
(Molar mass of Na_2CO_3 = 106 g mol^{-1})
(2010)

Options:

A. 0.955 M and 1.910 M

B. 1.910 M and 0.955 M

C. 1.90 M and 1.910 M

D. 0.477 and 0.477 M

Answer: B

Solution:

Given that molar mass of $Na_2CO_3 = 106g$

$\therefore$ Molarity of solution $-\frac{2.53 \times 1000}{106 \times 250} = -0.955M$

Na_2CO_3--------- $> 2Na^+ + CO_3^{2-}$

$[Na^+] - 2[Na_2CO_3] - 2 \times 0.955 - 1.910M$

$[CO_3^{2-}] - [Na_2CO_3] - 0.955M$

Question28

The number of atoms in 0.1 mol of a triatomic gas is $N_A - 6.02 \times 10^{23} mol^{-1}$
(2010)

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Options:

A. 6.026×10^{22}

B. 1.806×10^{23}

C. 3.600×10^{21}

D. 1.800×10^{22}

Answer: B

Solution:

Solution:
No. of atoms $= N_A \times$ No. of moles $\times 3$
$-6.023 \times 10^{23} \times 0.1 \times 3 - 1.806 \times 10^{23}$

Question29

10 g of hydrogen and 64 g of oxygen were filled in a steel vessel and exploded.Amount of water produced in this reaction will be
(2009)

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Options:

A. 3 mol

B. 4 mol

C. 1 mol

D. 2 mol

Answer: B

Solution:

Solution:

$H_2 + \frac{1}{2}O_2$--------- > H_2O

2g 16g 18 g

1 mol 0.5 mol 1 mol

10 g of $H_2 - 5$ mol and 64 g of O_2 = 2mol

∴ In this reaction,oxygen is the limitig reagent so amount of H_2O produced depends on that of O_2

Since 0.5 mol of O_2 gives 1 mol H_2O

∴ 2 mol of O_2 will give 4 mol H_2O

Question30

An organic compound contains carbon, hydrogen and oxygen,Its elemental analysis gave C, 38.71% and H, 9.67%.The empirical formula of the compound would be (2008)

Options:

A. CH O

B. CH_4O

C. CH_3O

D. CH_2O

Answer: C

Solution:

Solution:

Element	%	Atomic mass	Mole ratio	Simple ratio
C	38.71	12	$\frac{38.71}{12} = 3.22$	$\frac{3.22}{3.22} = 1$
H	9.67	1	$\frac{9.67}{1} = 9.67$	$\frac{9.67}{3.22} = 3$
O	51.62	16	$\frac{51.62}{16} = 3.22$	$\frac{3.22}{3.22} = 1$

Hence empirical formula of the compound would be CH_3O

Question31

How many moles of lead (II) chloride will be formed from a reaction between 6.5 g of PbO and 3.2 g HCl ?
(2008)

Options:

A. 0.011

B. 0.029

C. 0.044

D. 0.333

Answer: B

Solution:

Solution:
PbO + 2H Cl --------> $PbCl_2 + H_2O$
$\frac{6.5}{224}$ mol $\frac{3.2}{36.5}$ mol
= 0.029 mol = 0.087 mol
Formation of moles of lead (II) chloride depends upon th no of moles of PbO which acts as a limiting factor here,So no. of moles of $PbCl_2$ formed will be equal to the no of moles of PbO i.e., 0.029

Question32

What volume of oxygen gas (O_2) measured at 0°C and 1 atm, is needed to burn completely 1 L propane gas (C_3H_8) measured under the same conditions ?
(2008)

Options:

A. 5 L

B. 10 L

C. 7 L

D. 6 L

Answer: A

Solution:

$\underset{1\text{ vol}}{C_3H_8} + \underset{5\text{ vol}}{5O_2} \rightarrow \underset{3\text{ vol}}{3CO_2} + \underset{4\text{ vol}}{4H_2O}$(balanced equation)

According to the above equation
1 vol. or 1 litre of propane requires to 5 vol. or 5 litre of O_2 to burn completely.

Question33

An element ,X the following isotopic composition :
^{200}X : 90% ^{199}X : 8.0% ^{202}X ; 2.0%
The weighted average atomic mass of the naturally occurring element X is closest to
(2007)

Options:

A. 201 amu

B. 202 amu

C. 199 amu

D. 200 amu

Answer: D

Solution:

Solution:
Average isotopic mass of X

$$= \frac{200 \times 90 + 199 \times 8 + 202 \times 2}{90 + 8 + 2}$$

$$= \frac{18000 + 1592 + 404}{100} = 199.96 \text{ a.m.u} \approx 200 \text{ a.m.u}$$

Question34

The maximum number of molecules is present in
(2004)

Options:

A. 15L of H_2 gas at STP

B. 5L of N_2 gas at STP

C. 0.5g of H_2 gas

D. 10g of O_2 gas.

Answer: A

Solution:

Solution:

At STP, 22.4L = 6.023×10^{23} molecules

$15LH_2 = \frac{6.023 \times 10^{23} \times 15}{22.4} = 4.033 \times 10^{23}$

$5LN_2 = \frac{6.023 \times 10^{23} \times 5}{22.4} = 1.344 \times 10^{23}$

$2gH_2 = 6.023 \times 10^{23}$

$0.5gH_2 = \frac{6.023 \times 10^{23} \times 0.5}{2} = 1.505 \times 10^{23}$

$32gO_2 = 6.023 \times 10^{23}$

10g of

$O_2 = \frac{6.023 \times 10^{23} \times 10}{32} = 1.882 \times 10^{23}$

Question35

Which has maximum molecules? (2002)

Options:

A. 7 g N_2

B. 2 g H_2

C. 16 g NO_2

D. 16 g O_2

Answer: B

Solution:

Number of molecules = moles $\times N_A$

Molecules of $N_2 = \frac{7}{14} N_A = 0.5 N_A$

Molecules of $H_2 = 2N_A$

Molecules of $NO_2 = \frac{16}{46} = 0.35 N_A$

Molecules of $O_2 = \frac{16}{32} = 0.5 N_A$

$\therefore$ $2gH_2$ ($1g$ mole H_2) contains maximum molecules.

Question36

Percentage of Se in peroxidase anhydrous enzyme is 0.5% by weight (at.

wt. = 78.4) then minimum molecular weight of peroxidase anhydrous enzyme is
(2001)

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Options:

A. 1.568×10^4

B. 1.568×10^3

C. 15.68

D. 2.136×10^4

Answer: A

Solution:

Solution:
In peroxidase anhydrous enzyme 0.5% Se is present means, 0.5g Se is present in 100g of enzyme. In a molecule of enzyme one Se atom must be present. Hence, 78.4g Se will be present in $\frac{100}{0.5} \times 78.4 = 1.568 \times 10^4$

Question37

Molarity of liquid HCl, if density of solution is 1.17g/cc is
(2001)

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Options:

A. 36.5

B. 18.25

C. 32.05

D. 42.10

Answer: C

Solution:

Density $= 1.17 g/cc$
$\Rightarrow 1cc.$ solution contains $1.17g$ of $H\,Cl$
$\therefore$ Molarity $= \frac{1.17 \times 1000}{36.5 \times 1} = 32.05$

Question38

Specific volume of cylindrical virus particle is 6.02×10^{-2}cc/g whose radius and length are 7Å and 10Å respectively. If $N_A = 6.02 \times 10^{23}$ find molecular weight of virus.
(2001)

Options:

A. 15.4kg/mol

B. 1.54×10^4kg/mol

C. 3.08×10^4kg/mol

D. 3.08×10^3kg/mol

Answer: A

Solution:

Solution:
Specific volume (vol. of 1g) of cylindrical virus particle $= 6.02 \times 10^{-2}$cc/g
Radius of virus, $r = 7Å = 7 \times 10^{-8}$cm
Volume of virus $= \pi r^2 l$
$= \frac{22}{7} \times (7 \times 10^{-8})^2 \times 10 \times 10^{-8} = 154 \times 10^{-23}$cc
wt. of one virus particle $= \frac{\text{Volume}}{\text{Specific volume}}$
$= \frac{154 \times 10^{-23}}{6.02 \times 10^{-2}}$g
∴ Molecular wt. of virus = wt. of N_A particles
$= \frac{154 \times 10^{-23}}{6.02 \times 10^{-2}} \times 6.02 \times 10^{-23}$g/mol
$= 15400$g/mol $= 15.4$kg/mol

Question39

Volume of CO_2 obtained by the complete decomposition of 9.85g of $BaCO_3$ is
(2000)

Options:

A. 2.24L

B. 1.12L

C. 0.84L

D. 0.56L

Answer: B

Solution:

$BaCO_3 \rightarrow BaO + CO_2$
197.34 g 22.4 L at N.T.P
9.85g $\frac{22.4}{197.34} \times 9.85$
$= 1.118$ L

$\Rightarrow$9.85g $BaCO_3$ will produce 1.118 L CO_2 at N.T.P. on the complete decomposition.

Question40

Oxidation numbers of A, B, C are +2,+5 and -2 respectively. Possible formula of compound is (2000)

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Options:

A. $A_2(BC_2)_2$

B. $A_3(BC_4)_2$

C. $A_2(BC_3)_2$

D. $A_3(B_2C)_2$

Answer: B

Solution:

In
$A_3(BC_4)_2$, $(+2) \times 3 + 2[+5 + 4(-2)]$
$\Rightarrow +6 + 2(-3) = 0$
Hence, in the compound $A_3(BC_4)_2$, the oxidation no. of $'A'$, $'B'$ and $'C'$ are +2,+5 and -2 respectively.

Question41

The number of atoms in 4.25g of NH_3 is approximately (1999)

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Options:

A. 4×10^{23}

B. 2×10^{23}

C. 1×10^{23}

D. 6×10^{23}

Answer: D

Solution:

Solution:
No. of molecules in $4.25 g NH_3$
$= \frac{4.25}{17} \times 6.023 \times 10^{23} = 2.5 \times 6.023 \times 10^{22}$
Number of atoms in $4.25 g NH_3$
$= 4 \times 2.5 \times 6.023 \times 10^{22} = 6.023 \times 10^{23}$

Question42

Given the numbers : 161cm, 0.161cm, 0.0161cm. The number of significant figures for the three numbers is (1998)

Options:

A. 3, 3 and 4 respectively

B. 3, 4 and 4 respectively

C. 3, 4 and 5 respectively

D. 3, 3 and 3 respectively.

Answer: D

Solution:

Solution:
Zeros placed left to the number are never significant, therefore the no. of significant figures for the numbers.
161cm = 0.161cm and 0.0161cm are same, i.e., 3

Question43

Haemoglobin contains 0.334% of iron by weight. The molecular weight of haemoglobin is approximately 67200. The number of iron atoms (Atomic weight of Fe is 56) present in one molecule of haemoglobin is (1998)

Options:

A. 4

B. 6

C. 3

D. 2

Answer: A

Solution:

Solution:
Quantity of iron in one molecule
$= \frac{67200}{100} \times 0.334 = 224.45\text{amu}$
No. of iron atoms in one molecule of haemoglobin $= \frac{224.45}{56} = 4$

Question44

In the reaction,
$4NH_{3(g)} + 5O_{2(g)} \rightarrow 4NO_{(g)} + 6H_2O_{(l)}$
when 1 mole of ammonia and 1 mole of O_2 are made to react to completion :
(1998)

Options:

A. all the oxygen will be consumed

B. 1.0 mole of NO will be produced

C. 1.0 mole of H_2O is produced

D. all the ammonia will be consumed.

Answer: A

Solution:

Solution:
$4NH_{3(g)} + 5O_{2(g)} \rightarrow 4NO_{(g)} + 6H_2O_{(l)}$
4 mole 5 mole 4 mole 6 mole
$\Rightarrow$1 mole of NH_3 requires $= \frac{5}{4} = 1.25$ mole of
oxygen while 1 mole of O_2 requires $= \frac{4}{5} = 0.8$ mole of NH_3
Therefore, all oxygen will be consumed.

Question45

0.24g of a volatile gas, upon vaporisation, gives 45mL vapour at NTP.

What will be the vapour density of the substance? (Density of $H_2 = 0.089 g/L$)
(1996)

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Options:

A. 95.93

B. 59.93

C. 95.39

D. 5.993

Answer: B

Solution:

Solution:
Weight of gas $= 0.24 g$
Volume of gas $= 45 mL = 0.045$ litre and density of $H_2 = 0.089$
weight of $45 mL$ of $H_2 =$ density × volume $= 0.089 \times 0.045 = 4.005 \times 10^{-3} g$
Therefore, vapour density
$$= \frac{\text{Weight of certain volume of substance}}{\text{Weight of same volume of hydrogen}}$$
$$= \frac{0.24}{4.005 \times 10^{-3}} = 59.93$$

Question46

The amount of zinc required to produce 224mL of H_2 at STP on treatment with dilute H_2SO_4 will be
(1996)

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Options:

A. 65g

B. 0.065g

C. 0.65g

D. 6.5g

Answer: C

Solution:

Solution:
$$\underset{65g}{Zn} + H_2SO_4 \rightarrow ZnSO_4 + \underset{22400ml}{H_2}$$
since 65g of zinc reacts to liberate 22400mL of H_2 at STP, therefore amount of zinc needed to produce 224mL of H_2 at

STP

$= \frac{65}{22400} \times 224 = 0.65g$

Question47

The dimensions of pressure are the same as that of (1995)

Options:

A. force per unit volume

B. energy per unit volume

C. force

D. energy.

Answer: B

Solution:

Solution:

Pressure $= \frac{\text{Force}}{\text{Area}}$

Therefore, dimensions of pressure $= \frac{M\,LT^{-2}}{L^2}$

$= M\,L^{-1}T^{-2}$

and dimensions of energy per unit volume

$= \frac{\text{Energy}}{\text{Volume}} = \frac{M\,L^2T^{-2}}{L^3} = M\,L^{-1}T^{-2}$

Question48

The number of moles of oxygen in one litre of air containing 21% oxygen by volume, under standard conditions, is (1995)

Options:

A. 0.0093mol

B. 2.10mol

C. 0.186mol

D. 0.21 mol.

Answer: A

Solution:

Volume of oxygen in one litre of air

$= \frac{21}{100} \times 1000 = 210 \text{mL}$

Therefore, no. of mol $= \frac{210}{22400} = 0.0093 \text{mol}$

Question49

The total number of valence electrons in 4.2g of N_3^- ion is (N_A is the Avogadro's number)
(1994)

Options:

A. $2.1 N_A$

B. $4.2 N_A$

C. $1.6 N_A$

D. $3.2 N_A$

Answer: C

Solution:

Solution:

Each nitrogen atom has 5 valence electrons, therefore total number of electrons in N_3^- ion is 16. since the molecular mass of N_3 is 42, therefore total number of electrons in 4.2g of N_3^- ion $= \frac{4.2}{42} \times 16 \times N_A = 1.6 N_A$

Question50

A 5 molar solution of H_2SO_4 is diluted from 1 litre to a volume of 10 litres, the normality of the solution will be
(1991)

Options:

A. 1N

B. 0.1N

C. 5N

D. 0.5N

Answer: A

Solution:

$5M\ H_2SO_4 = 10N\ H_2SO_4$
$N_1V_1 = N_2V_2 \Rightarrow 10 \times 1 = N_2 \times 10 \Rightarrow N_2 = 1N$

Question51

The number of gram molecules of oxygen in 6.02×10^{24} CO molecules is (1990)

Options:

A. 10g molecules

B. 5g molecules

C. 1g molecules

D. 0.5g molecules.

Answer: B

Solution:

Solution:
Avogadro's No., $N_A = 6.02 \times 10^{23}$ molecules
$\therefore\ 6.02 \times 10^{24}$CO molecules = 10 moles CO
= 10g atoms of O = 5g molecules of O_2

Question52

Boron has two stable isotopes, $^{10}B(19\%)$ and $^{11}B(81\%)$. Calculate average at. wt. of boron in the periodic table.
(1990)

Options:

A. 10.8

B. 10.2

C. 11.2

D. 10.0

Answer: A

Solution:

Solution:
Average atomic mass $= \frac{19 \times 10 + 81 \times 11}{100} = 10.81$

Question53

The molecular weight of O_2 and SO_2 are 32 and 64 respectively. At 15°C and150mmH g pressure, one litre of O_2 contains "N molecules. The number of molecules in two litres of SO_2 under the same conditions of temperature and pressure will be
(1990)

Options:

A. $\frac{N}{2}$

B. N

C. 2N

D. 4N

Answer: C

Solution:

Solution:
If 1L of one gas contains N molecules, 2L of any gas under the same conditions will contain 2N molecules.

Question54

A metal oxide has the formula Z_2O_3. It can be reduced by hydrogen to give free metal and water. 0.1596g of the metal oxide requires 6mg of hydrogen for complete reduction. The atomic weight of the metal is
(1989)

Options:

A. 27.9

B. 159.6

C. 79.8

D. 55.8

Answer: D

Solution:

Solution:
$Z_2O_3 + 3H_2 \rightarrow 2Z + 3H_2O$
Valency of metal in $Z_2O_3 = 3$
0.1596g of Z_2O_3 react with 6mg of H_2.
$[1mg = 0.001g = 10^{-3}g]$
$\therefore$ 1g of H_2 react with $= \frac{0.1596}{0.006} = 26.6g$ of Z_2O_3
$\therefore$ Eq. wt. of $Z_2O_3 = 26.6$
Now, Eq. wt. of Z + Eq. wt. of O = Eq. wt. of Z + 8 = 26.6
$\Rightarrow$ Eq. wt. of Z $= 26.6 - 8 = 18.6$
$\therefore$ At. wt. of Z $= 18.6 \times 3 = 55.8$
$\left[\because \text{Eq. wt.} = \frac{\text{Atomic wt.}}{\text{Valency of metal}}\right]$

Question55

Ratio of C_p and C_V of a gas X is 1.4. The number of atoms of the gas X " present in 11.2 litres of it at NTP will be (1989)

Options:

A. 6.02×10^{23}

B. 1.2×10^{23}

C. 3.01×10^{23}

D. 2.01×10^{23}

Answer: A

Solution:

Solution:
Here, $C_p/C_V = 1.4$, which shows that the gas is diatomic
22.4L at N T P $= 6.02 \times 10^{23}$ molecules
$\therefore$ 11.2L at N T P $= 3.01 \times 10^{23}$ molecules
since gas is diatomic.
$\therefore$ 11.2L at N T P $= 6.02 \times 10^{23}$ atom

Question56

What is the weight of oxygen required for the complete combustion of

2.8kg of ethylene?
(1989)

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Options:

A. 2.8kg

B. 6.4kg

C. 9.6kg

D. 96kg

Answer: C

Solution:

$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$
28g 96g
For complete combustion
2.8kg of C_2H_4 requires
$= \frac{96g}{28g} \times 2.8kg$ of $O_2 = \frac{96}{28} \times 2.8 \times 10^3 g$
$= 9.6 \times 10^3 g = 9.6kg$ of O_2

Question57

The number of oxygen atoms in 4.4g of CO_2 is
(1989)

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Options:

A. 1.2×10^{23}

B. 6×10^{22}

C. 6×10^{23}

D. 12×10^{23}

Answer: A

Solution:

Solution:
1 mol of CO_2 = 44g of CO_2
$\therefore 4.4g CO_2 = 0.1 mol CO_2 = 6 \times 10^{22}$ molecules
[since, 1 mole $CO_2 = 6 \times 10^{23}$ molecules]
$= 2 \times 6 \times 10^{22}$ atoms of O $= 1.2 \times 10^{23}$ atoms of O

Question58

At S.T.P. the density of CCl_4 vapour in g/L will be nearest to (1988)

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Options:

A. 6.87

B. 3.42

C. 10.26

D. 4.57

Answer: A

Solution:

Solution:
Weight of 1 mol CCl_4 vapour
$= 12 + 4 \times 35.5 = 154g$
$\therefore$ Density of CCl_4 vapour $= \frac{154}{22.4} gL^{-1}$
$= 6.875 gL^{-1}$

Question59

One litre hard water contains 12.00mg Mg^{2+}. Milli-equivalents of washing soda required to remove its hardness is
(1988)

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Options:

A. 1

B. 12.16

C. 1×10^{-3}

D. 12.16×10^{-3}

Answer: A

Solution:

Solution:
$Mg^{2+} + Na_2CO_3 \rightarrow MgCO_3 + 2Na^+$
1g eq.   1geq.

1g eq. of Mg^{2+} = 12g of Mg^{2+} = 12000mg
Now, 1000 millieq. of Na_2CO_3 = 12000mg of Mg^{2+}
$\therefore$ 1 millieq. of Na_2CO_3 = 12mg of Mg^{2+}

Question60

**1ccN_2O at NTP contains
(1988)**

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Options:

A. $\frac{1.8}{224} \times 10^{22}$ atoms

B. $\frac{6.02}{22400} \times 10^{23}$ molecules

C. $\frac{1.32}{224} \times 10^{23}$ electrons

D. all of the above.

Answer: D

Solution:

As we know
22400cc of N_2O contain 6.02×10^{23} molecules
$\therefore$ 1 cc of N_2O contain $\frac{6.02 \times 10^{23}}{22400}$ molecules
since in N_2O molecule there are 3 atoms
$\therefore$ $1cc\ N_2O = \frac{3 \times 6.02 \times 10^{23}}{22400}$ atoms
$= \frac{1.8 \times 10^{22}}{224}$ atoms
No. of electrons in a molecule of
$N_2O = 7 + 7 + 8 = 22$
Hence, no. of electrons $= \frac{6.02 \times 10^{23}}{22400} \times 22$ electron
$= \frac{1.32}{224} \times 10^{23}$ electrons
