

## 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 :  $180\text{g mol}^{-1}$ )

[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

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

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

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

$$= 2.25\text{g}$$

### Question2

1.0 g of  $\text{H}_2$  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:

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

$$\text{Number of molecules of } H_2 = 0.5N_A$$

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

$$\text{Number of molecules of } N_2 = 0.5N_A$$

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

$$\text{Number of molecules of } H_2O = 1 \times N_A = N_A$$

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

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

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

$$\text{Number of molecules of } N_2 = 1 \times N_A = N_A$$

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## 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:**

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

$$m = \text{mass of organic compound} = 0.3\text{g}$$

$$m_2 = \text{mass of carbon dioxide} = 0.2\text{g}$$

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

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

$$m_1 = \text{mass of water} = 0.1\text{g}$$

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

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## Question4

**1 gram of sodium hydroxide was treated with 25 mL of 0.75 M HCl 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**

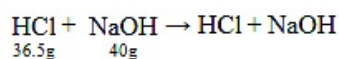


## Solution:

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

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

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



36.5g HCl reacts with NaOH = 40g

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

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

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## 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 =  $4 N_A$  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

=  $0.1 N_A$  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.



B.



C.



D.



**Answer: B**

**Solution:**

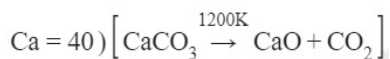
Element	Masspercentage %	No. of moles	No. of moles/Smallest number	Simplest whole number
A	32%	$\frac{32}{64} = \frac{1}{2}$	$\frac{1}{2} \times 2$	= 1
B	20%	$\frac{20}{40} = \frac{1}{2}$	$\frac{1}{2} \times 2$	= 1
C	48%	$\frac{48}{32} = \frac{3}{2}$	$\frac{3}{2} \times 2$	= 3

So, empirical formula of X =  $A : B : C$   
 $1 : 1 : 3$

∴ 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



## [NEET 2023]

### Options:

A.

1.76g

B.

2.64g

C.

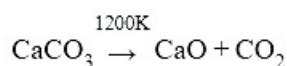
1.32g

D.

1.12g

**Answer: A**

### Solution:



From 100gCaCO<sub>3</sub> → 44gCO<sub>2</sub> produced

As CaCO<sub>3</sub> is 20% pure

$$\text{So, mass of pure CaCO}_3 = 20 \times \frac{20}{100} = 4\text{g}$$

So, 100gCaCO<sub>3</sub> → 44gCO<sub>2</sub>

$$4\text{gCaCO}_3 \rightarrow \frac{44}{100} \times 4\text{gCO}_2$$

$$= 1.76\text{gCO}_2$$

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## Question8

The density of 1M solution of a compound ' X ' is 1.25gmL<sup>-1</sup>. 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:**

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

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

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

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## Question9

What mass of 95% pure  $\text{CaCO}_3$  will be required to neutralise 50mL of 0.5M HCl solution according to the following reaction?



[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  $\text{CaCO}_3$  is required

$$\text{Pure } \text{CaCO}_3 \text{ in } m \text{ gram} = \frac{95}{100} \times m$$

$$\text{Moles of } \text{CaCO}_3 = \frac{95}{100} \times \frac{m}{100}$$

Moles of  $\text{HCl}$  required =  $2 \times$  moles of  $\text{CaCO}_3$

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

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

$$m = 1.315\text{g} \approx 1.32\text{g}$$

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## 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.  $\text{CH}$
- B.  $\text{CH}_2$
- C.  $\text{CH}_3$
- D.  $\text{CH}_4$

**Answer: C**

**Solution:**

**Solution:**

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

Based on above calculation, possible empirical formula is  $\text{CH}_3$ .

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## 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<sub>2</sub> [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:**

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

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

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

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

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

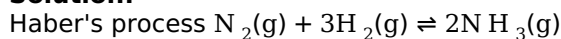
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**Question12**

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

**Options:**

- A. 40
- B. 10
- C. 20
- D. 30

**Answer: D****Solution:****Solution:**

20 moles needs to be produced

2 moles NH<sub>3</sub> → 3 moles of H<sub>2</sub>

Hence 20 moles of NH<sub>3</sub> →  $\frac{3 \times 20}{2} = 30$  of moles of H<sub>2</sub>

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## Question13

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

Options:

- A. 1.20m
- B. 1.56m
- C. 1.67m
- D. 1.32m

Answer: C

Solution:

Density =  $1.28\text{g/cc}$

Conc. of solution = 2M

Molar mass of NaOH =  $40\text{gmol}^{-1}$

Volume of solution = 1L = 1000mL

Mass of solution =  $d \times V = 1280\text{g}$

Mass of solute =  $n \times \text{Molar mass} = 2 \times 40 = 80\text{g}$

Mass of solvent =  $(1280 - 80)\text{g} = 1200\text{g}$

Number of moles of solute =  $\frac{80}{40} = 2$

$\therefore$  Molality =  $\frac{2 \times 1000}{1200} = 1.67\text{m}$

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## Question14

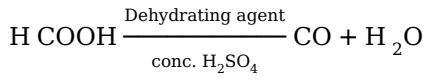
A mixture of 2.3g formic acid and 4.5g oxalic acid is treated with conc.  $\text{H}_2\text{SO}_4$ . The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be  
(NEET 2018)

Options:

- A. 1.4
- B. 3.0
- C. 2.8
- D. 4.4

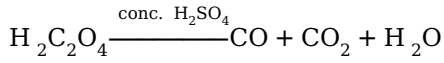
Answer: C

## Solution:



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

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



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

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

$\text{H}_2\text{O}$  absorbed by  $\text{H}_2\text{SO}_4$ . Gaseous mixture (containing CO and  $\text{CO}_2$ ) when passed through KOH pellets,  $\text{CO}_2$  gets absorbed.

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

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

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## Question15

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

### 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 =  $V \times d = 18 \times 1 = 18\text{g}$

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

(b) Molecules of water =  $\text{mole} \times N_A = \frac{0.18}{18} N_A$   
 $= 10^{-2} N_A$

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

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

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

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## 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 0.05 mole 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.

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

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

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

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

On solving equations (i) and (ii), we get  $y = 30$   
 $x + 2(30) = 100 \Rightarrow x = 100 - 60 = 40$

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## Question 17

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:**

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

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## Question 18

If Avogadro number  $N_A$ , is changed from  $6.022 \times 10^{23} \text{ mol}^{-1}$  to  $6.022 \times 10^{20} \text{ mol}^{-1}$ , 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 ( $6.022 \times 10^{23}$  atoms) of carbon = 12g  
If Avogadro number is changed to  $6.022 \times 10^{20}$  atoms then  
mass of 1 mol of carbon =  $\frac{12 \times 6.022 \times 10^{20}}{6.022 \times 10^{23}} = 12 \times 10^{-3} \text{ g}$

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## Question 19

What is the mass of the precipitate formed when 50 mL. of 16.9 % solution of  $\text{AgNO}_3$  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:**

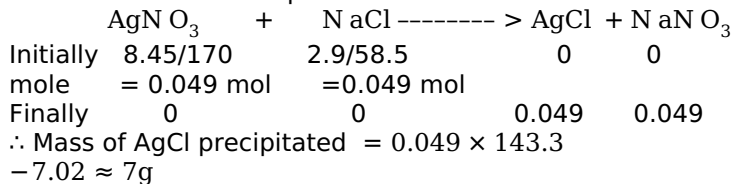
**Solution:**

16.9% solution of  $\text{AgNO}_3$  means 16.9g of  $\text{AgNO}_3$  in 100 mL of solution.

16.9 g of  $\text{AgNO}_3$  in 100 mL solution = 8.45 g of  $\text{AgNO}_3$  in 50 mL solution.

Similarly, 5.8% of  $\text{NaCl}$  in 100 mL solution = 2.9 g of  $\text{NaCl}$  in 50 mL solution.

The reaction can be represented as:



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## Question20

**A mixture of gases contains  $\text{H}_2$  and  $\text{O}_2$  gases in the ratio of 1 : 4 (w/w), What is the ratio of the two gases in the mixture ? (2015 Cancelled)**

**Options:**

- A. 16 : 1
- B. 2 : 1
- C. 1 : 4
- D. 4 : 1

**Answer: D**

**Solution:**

**Solution:**

Number of moles  $\text{H}_2 = \frac{1}{2}$

Number of moles of  $\text{O}_2 = \frac{4}{32}$

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

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## Question21

**1.0 g of magnesium is burnt with 0.56 g  $\text{O}_2$  in a closed vessel. Which reactant is left in excess and how much ? (At. wt. Mg = 24, O = 16) (2014)**

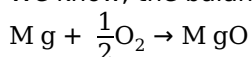
**Options:**

- A. Mg, 0.16 g  
 B. O<sub>2</sub>, 0.16 g  
 C. Mg, 0.44 g  
 D. O<sub>2</sub>, 0.28 g

**Answer: A****Solution:****Solution:**

Given Data, 1.0g of magnesium is burnt with 0.56gO<sub>2</sub>

We know, the balanced chemical reaction of the above phenomena is as follows:



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<sub>2</sub> are 24 and 32 moles respectively as per the chemical properties of magnesium and oxygen. Hence, the number of moles of Mg and O<sub>2</sub> 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<sub>2</sub> in a closed vessel, 0.16g magnesium is left in excess.

**Question22**

**When 22.4 liters of H<sub>2</sub>(g) is mixed with 11.2 liters of Cl<sub>2</sub>(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<sub>(g)</sub>

**Answer: A**

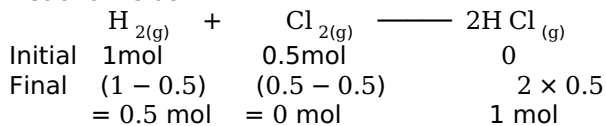
**Solution:**

**Solution:**

1 mole = 22.4 litres at S.T.P.

$$n_{\text{H}_2} = \frac{22.4}{22.4} = 1 \text{ mol}, n_{\text{Cl}_2} = \frac{11.2}{22.4} = 0.5 \text{ mol}$$

Reaction is as



Here, Cl<sub>2</sub> is limiting reagent. So, 1 mole of HCl(g) is formed

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## Question23

**Equal masses of H<sub>2</sub>, O<sub>2</sub> 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<sub>2</sub> : O<sub>2</sub> : 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, ratio of the volumes of gases will be equal to the ratio of their no. of moles.

$$\text{So, no. of moles} = \frac{\text{Mass}}{\text{Mol. mass}}$$

$$n_{\text{H}_2} = \frac{W}{2}; n_{\text{O}_2} = \frac{W}{32}; n_{\text{CH}_4} = \frac{W}{16}$$

$$\text{So, the ratio is } \frac{W}{2} : \frac{W}{32} : \frac{W}{16} \text{ or } 16 : 1 : 2$$

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## Question24

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



**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 = 0.1L

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

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

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## Question25

**In an experiment it showed that 10mL of 0.05M solution of chloride required 10mL of 0.1M solution of  $\text{AgNO}_3$ , 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.  $\text{X}_2\text{Cl}_2$
- B.  $\text{XCl}_2$
- C.  $\text{XCl}_4$
- D.  $\text{X}_2\text{Cl}$

**Answer: B**

**Solution:**

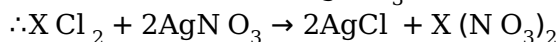


Millimoles of solution of chloride

$$= 0.05 \times 10 = 0.5$$

$$\text{Millimoles of AgNO}_3 \text{ solution} = 10 \times 0.1 = 1$$

So, the millimoles of AgNO<sub>3</sub> are double than the chloride solution.



## Question26

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

**Options:**

A. 44 g CO<sub>2</sub>

B. 48 g O<sub>3</sub>

C. 8 g H<sub>2</sub>

D. 64 g SO<sub>2</sub>

**Answer: C**

**Solution:**

**Solution:**

8gH<sub>2</sub> has 4 moles while the others has 1 mole each

---

## Question27

25.3 g of sodium carbonate Na<sub>2</sub>CO<sub>3</sub> is dissolved in enough water to make 250 mL of solution. If sodium carbonate dissociates completely, molar concentration of sodium ion, Na<sup>+</sup> and carbonate ions, CO<sub>3</sub><sup>2-</sup> are respectively

(Molar mass of Na<sub>2</sub>CO<sub>3</sub> = 106 g mol<sup>-1</sup>)

(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

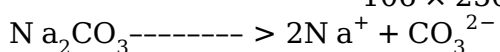


**Answer: B**

**Solution:**

Given that molar mass of  $\text{Na}_2\text{CO}_3 = 106\text{g}$

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



$$[\text{Na}^+] = 2[\text{Na}_2\text{CO}_3] = 2 \times 0.955 = 1.910\text{M}$$

$$[\text{CO}_3^{2-}] = [\text{Na}_2\text{CO}_3] = 0.955\text{M}$$

## Question28

**The number of atoms in 0.1 mol of a triatomic gas is**

$$N_A = 6.02 \times 10^{23} \text{mol}^{-1}$$

**(2010)**

**Options:**

A.  $6.026 \times 10^{22}$

B.  $1.806 \times 10^{23}$

C.  $3.600 \times 10^{21}$

D.  $1.800 \times 10^{22}$

**Answer: B**

**Solution:**

**Solution:**

$$\text{No. of atoms} = N_A \times \text{No. of moles} \times 3$$

$$= 6.023 \times 10^{23} \times 0.1 \times 3 = 1.806 \times 10^{23}$$

## 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)**

**Options:**

A. 3 mol

B. 4 mol

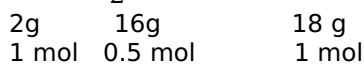
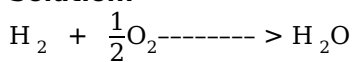
C. 1 mol

D. 2 mol

**Answer: B**

**Solution:**

**Solution:**



10 g of  $\text{H}_2 = 5\text{ mol}$  and 64 g of  $\text{O}_2 = 2\text{ mol}$

$\therefore$  In this reaction, oxygen is the limiting reagent so amount of  $\text{H}_2\text{O}$  produced depends on that of  $\text{O}_2$

Since 0.5 mol of  $\text{O}_2$  gives 1 mol  $\text{H}_2\text{O}$

$\therefore$  2 mol of  $\text{O}_2$  will give 4 mol  $\text{H}_2\text{O}$

## Question 30

**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.  $\text{CH O}$

B.  $\text{CH}_4\text{O}$

C.  $\text{CH}_3\text{O}$

D.  $\text{CH}_2\text{O}$

**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  $\text{CH}_3\text{O}$

## 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)

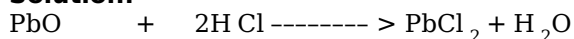
Options:

- A. 0.011
- B. 0.029
- C. 0.044
- D. 0.333

Answer: B

Solution:

Solution:



$$\frac{6.5}{224} \text{ mol} \quad \frac{3.2}{36.5} \text{ mol}$$

$$= 0.029 \text{ mol} \quad = 0.087 \text{ mol}$$

Formation of moles of lead (II) chloride depends upon the no of moles of PbO which acts as a limiting factor here, So no. of moles of  $\text{PbCl}_2$  formed will be equal to the no of moles of PbO i.e., 0.029

---

## Question32

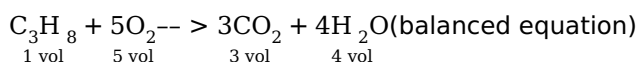
What volume of oxygen gas ( $\text{O}_2$ ) measured at  $0^\circ\text{C}$  and 1 atm, is needed to burn completely 1 L propane gas ( $\text{C}_3\text{H}_8$ ) measured under the same conditions ?  
(2008)

Options:

- A. 5 L
- B. 10 L
- C. 7 L
- D. 6 L

Answer: A

Solution:



According to the above equation

1 vol. or 1 litre of propane requires to 5 vol. or 5 litre of O<sub>2</sub> to burn completely.

---

## Question33

**An element ,X the following isotopic composition :**

**<sup>200</sup>X : 90% <sup>199</sup>X : 8.0% <sup>202</sup>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<sub>2</sub> gas at STP
- B. 5L of N<sub>2</sub> gas at STP
- C. 0.5g of H<sub>2</sub> gas
- D. 10g of O<sub>2</sub> gas.



**Answer: A**

**Solution:**

**Solution:**

At STP, 22.4L =  $6.023 \times 10^{23}$  molecules

$$15\text{LH}_2 = \frac{6.023 \times 10^{23} \times 15}{22.4} = 4.033 \times 10^{23}$$

$$5\text{LN}_2 = \frac{6.023 \times 10^{23} \times 5}{22.4} = 1.344 \times 10^{23}$$

$$2\text{gH}_2 = 6.023 \times 10^{23}$$

$$0.5\text{gH}_2 = \frac{6.023 \times 10^{23} \times 0.5}{2} = 1.505 \times 10^{23}$$

$$32\text{gO}_2 = 6.023 \times 10^{23}$$

10g of

$$\text{O}_2 = \frac{6.023 \times 10^{23} \times 10}{32} = 1.882 \times 10^{23}$$

---

## Question35

**Which has maximum molecules?  
(2002)**

**Options:**

A. 7 g N<sub>2</sub>

B. 2 g H<sub>2</sub>

C. 16 g NO<sub>2</sub>

D. 16 g O<sub>2</sub>

**Answer: B**

**Solution:**

Number of molecules = moles  $\times N_A$

$$\text{Molecules of N}_2 = \frac{7}{14} N_A = 0.5 N_A$$

$$\text{Molecules of H}_2 = 2 N_A$$

$$\text{Molecules of NO}_2 = \frac{16}{46} = 0.35 N_A$$

$$\text{Molecules of O}_2 = \frac{16}{32} = 0.5 N_A$$

$\therefore$  2gH<sub>2</sub> (1g mole H<sub>2</sub>) 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)

Options:

- A.  $1.568 \times 10^4$
- B.  $1.568 \times 10^3$
- C. 15.68
- D.  $2.136 \times 10^4$

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)

Options:

- A. 36.5
- B. 18.25
- C. 32.05
- D. 42.10

Answer: C

Solution:

Density = 1.17g/cc

⇒ 1cc. solution contains 1.17g of HCl

$$\therefore \text{Molarity} = \frac{1.17 \times 1000}{36.5 \times 1} = 32.05$$

---

## Question38





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

**Options:**

- A. 15.4kg/mol
- B.  $1.54 \times 10^4$ kg/mol
- C.  $3.08 \times 10^4$ kg/mol
- D.  $3.08 \times 10^3$ kg/mol

**Answer: A**

**Solution:**

**Solution:**

Specific volume (vol. of 1g) of cylindrical virus particle =  $6.02 \times 10^{-2}$ cc/g

Radius of virus,  $r = 7\text{\AA} = 7 \times 10^{-8}$ cm

Volume of virus =  $\pi r^2 l$

$$= \frac{22}{7} \times (7 \times 10^{-8})^2 \times 10 \times 10^{-8} = 154 \times 10^{-23} \text{cc}$$

$$\text{wt. of one virus particle} = \frac{\text{Volume}}{\text{Specific volume}}$$

$$= \frac{154 \times 10^{-23}}{6.02 \times 10^{-2}} \text{g}$$

$\therefore$  Molecular wt. of virus = wt. of  $N_A$  particles

$$= \frac{154 \times 10^{-23}}{6.02 \times 10^{-2}} \times 6.02 \times 10^{23} \text{g/mol}$$

$$= 15400 \text{g/mol} = 15.4 \text{kg/mol}$$

---

## Question39

**Volume of  $\text{CO}_2$  obtained by the complete decomposition of 9.85g of  $\text{BaCO}_3$  is (2000)**

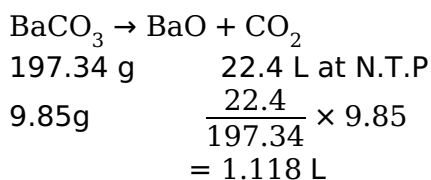
**Options:**

- A. 2.24L
- B. 1.12L
- C. 0.84L
- D. 0.56L

**Answer: B**

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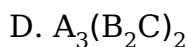
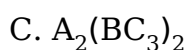
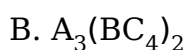
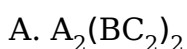
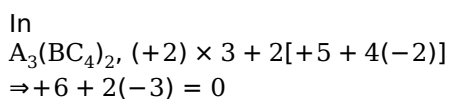
**Solution:**

⇒ 9.85g BaCO<sub>3</sub> will produce 1.118 L CO<sub>2</sub> 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)**

**Options:****Answer: B****Solution:**

Hence, in the compound A<sub>3</sub>(BC<sub>4</sub>)<sub>2</sub>, the oxidation no. of 'A', 'B' and 'C' are +2,+5 and -2 respectively.

---

## Question41

**The number of atoms in 4.25g of N H<sub>3</sub> is approximately (1999)**

**Options:**

A. 4 × 10<sup>23</sup>

B. 2 × 10<sup>23</sup>

C.  $1 \times 10^{23}$

D.  $6 \times 10^{23}$

**Answer: D**

**Solution:**

**Solution:**

No. of molecules in 4.25g  $\text{NH}_3$

$$= \frac{4.25}{17} \times 6.023 \times 10^{23} = 2.5 \times 6.023 \times 10^{22}$$

Number of atoms in 4.25g  $\text{NH}_3$

$$= 4 \times 2.5 \times 6.023 \times 10^{22} = 6.023 \times 10^{23}$$

---

## 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

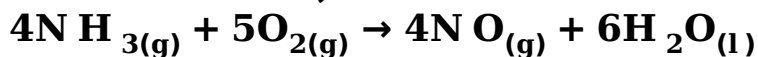
$$= \frac{67200}{100} \times 0.334 = 224.45 \text{amu}$$

$$\text{No. of iron atoms in one molecule of haemoglobin} = \frac{224.45}{56} = 4$$

---

## Question44

**In the reaction,**



**when 1 mole of ammonia and 1 mole of O<sub>2</sub> are made to react to completion :  
(1998)**

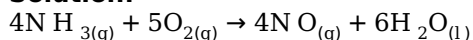
**Options:**

- A. all the oxygen will be consumed
- B. 1.0 mole of NO will be produced
- C. 1.0 mole of H<sub>2</sub>O is produced
- D. all the ammonia will be consumed.

**Answer: A**

**Solution:**

**Solution:**



4 mole    5 mole    4 mole    6 mole

$$\Rightarrow 1 \text{ mole of N H}_3 \text{ requires} = \frac{5}{4} = 1.25 \text{ mole of}$$

$$\text{oxygen while 1 mole of O}_2 \text{ requires} = \frac{4}{5} = 0.8 \text{ mole of N H}_3$$

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  $H_2 = 0.089\text{g/L}$ ) (1996)**

**Options:**

- A. 95.93
- B. 59.93
- C. 95.39
- D. 5.993

**Answer: B**

**Solution:**

**Solution:**

Weight of gas = 0.24g

Volume of gas = 45mL = 0.045 litre and density of  $H_2 = 0.089$

weight of 45mL of  $H_2 = \text{density} \times \text{volume} = 0.089 \times 0.045 = 4.005 \times 10^{-3}\text{g}$

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 ST P on treatment with dilute  $H_2SO_4$  will be (1996)**

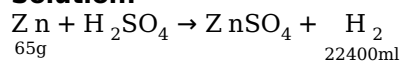
**Options:**

- A. 65g
- B. 0.065g
- C. 0.65g
- D. 6.5g

**Answer: C**

**Solution:**

**Solution:**



since 65g of zinc reacts to liberate 22400mL of  $H_2$  at ST P, therefore amount of zinc needed to produce 224mL of  $H_2$  at

STP

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

---

## 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:**

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

$$\text{Therefore, dimensions of pressure} = \frac{\text{MLT}^{-2}}{\text{L}^2}$$

$$= \text{ML}^{-1}\text{T}^{-2}$$

and dimensions of energy per unit volume

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

---

## 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

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

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

---

## Question49

**The total number of valence electrons in 4.2g of  $\text{N}_3^-$  ion is ( $N_A$  is the Avogadro's number) (1994)**

### Options:

A.  $2.1N_A$

B.  $4.2N_A$

C.  $1.6N_A$

D.  $3.2N_A$

**Answer: C**

### Solution:

#### Solution:

Each nitrogen atom has 5 valence electrons, therefore total number of electrons in  $\text{N}_3^-$  ion is 16. since the molecular mass of  $\text{N}_3$  is 42, therefore total number of electrons in 4.2g of  $\text{N}_3^-$  ion =  $\frac{4.2}{42} \times 16 \times N_A = 1.6N_A$

---

## Question50

**A 5 molar solution of  $\text{H}_2\text{SO}_4$  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:**

$$5M H_2SO_4 = 10N H_2SO_4$$
$$N_1 V_1 = N_2 V_2 \Rightarrow 10 \times 1 = N_2 \times 10 \Rightarrow N_2 = 1N$$

---

## Question51

**The number of gram molecules of oxygen in  $6.02 \times 10^{24}$  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,  $^{10}\text{B}$ (19%) and  $^{11}\text{B}$ (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:**

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

---

## Question53

The molecular weight of  $O_2$  and  $SO_2$  are 32 and 64 respectively. At  $15^\circ C$  and  $150\text{mmHg}$  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



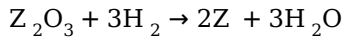
C. 79.8

D. 55.8

**Answer: D**

**Solution:**

**Solution:**



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]

$$\therefore 1\text{g of } H_2 \text{ react with } = \frac{0.1596}{0.006} = 26.6\text{g of } Z_2O_3$$

$$\therefore \text{Eq. wt. of } Z_2O_3 = 26.6$$

Now, Eq. wt. of Z + Eq. wt. of O = Eq. wt. of  $Z_2O_3 = 26.6$

$$\Rightarrow \text{Eq. wt. of Z} = 26.6 - 8 = 18.6$$

$$\therefore \text{At. wt. of Z} = 18.6 \times 3 = 55.8$$

$$\left[ \therefore \text{Eq. wt.} = \frac{\text{Atomic wt.}}{\text{Valency of metal}} \right]$$

---

## 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.  $6.02 \times 10^{23}$

B.  $1.2 \times 10^{23}$

C.  $3.01 \times 10^{23}$

D.  $2.01 \times 10^{23}$

**Answer: A**

**Solution:**

**Solution:**

Here,  $C_p/C_v = 1.4$ , which shows that the gas is diatomic

$$22.4\text{L at NTP} = 6.02 \times 10^{23} \text{ molecules}$$

$$\therefore 11.2\text{L at NTP} = 3.01 \times 10^{23} \text{ molecules}$$

since gas is diatomic.

$$\therefore 11.2\text{L at NTP} = 6.02 \times 10^{23} \text{ atom}$$

---

## Question56

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

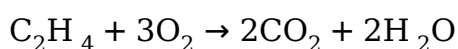
## 2.8kg of ethylene? (1989)

### Options:

- A. 2.8kg
- B. 6.4kg
- C. 9.6kg
- D. 96kg

**Answer: C**

### Solution:



28g      96g

For complete combustion

2.8kg of  $\text{C}_2\text{H}_4$  requires

$$\begin{aligned} &= \frac{96\text{g}}{28\text{g}} \times 2.8\text{kg of O}_2 = \frac{96}{28} \times 2.8 \times 10^3\text{g} \\ &= 9.6 \times 10^3\text{g} = 9.6\text{kg of O}_2 \end{aligned}$$

---

## Question57

### The number of oxygen atoms in 4.4g of $\text{CO}_2$ is (1989)

### Options:

- A.  $1.2 \times 10^{23}$
- B.  $6 \times 10^{22}$
- C.  $6 \times 10^{23}$
- D.  $12 \times 10^{23}$

**Answer: A**

### Solution:

#### Solution:

1 mol of  $\text{CO}_2 = 44\text{g}$  of  $\text{CO}_2$

$\therefore 4.4\text{gCO}_2 = 0.1\text{ mol CO}_2 = 6 \times 10^{22}$  molecules

[since, 1 mole  $\text{CO}_2 = 6 \times 10^{23}$  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  $\text{CCl}_4$  vapour in g/L will be nearest to (1988)

Options:

- A. 6.87
- B. 3.42
- C. 10.26
- D. 4.57

Answer: A

Solution:

Solution:

Weight of 1 mol  $\text{CCl}_4$  vapour  
 $= 12 + 4 \times 35.5 = 154\text{g}$

$$\therefore \text{Density of } \text{CCl}_4 \text{ vapour} = \frac{154}{22.4} \text{gL}^{-1}$$
$$= 6.875 \text{gL}^{-1}$$

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## Question59

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

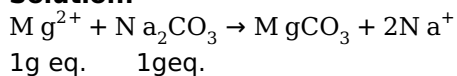
Options:

- A. 1
- B. 12.16
- C.  $1 \times 10^{-3}$
- D.  $12.16 \times 10^{-3}$

Answer: A

Solution:

Solution:



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  $Mg^{2+}$

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## Question60

**1cc  $N_2O$  at NTP contains  
(1988)**

**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  $6.02 \times 10^{23}$  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

$\therefore 1$ cc  $N_2O = \frac{3 \times 6.02 \times 10^{23}}{22400}$  atoms

$$= \frac{1.8 \times 10^{22}}{224} \text{ atoms}$$

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

$$= \frac{1.32}{224} \times 10^{23} \text{ electrons}$$

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