Some Basic Concepts of Chemistry Important Questions With Answers

NEET Chemistry 2023

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1. Which one of the following has maximum number of atoms :

a) 1 g of Ag (s) Atomic mass of Ag = 108 b) 1 g of O_2 (g) Atomic mass of O = 16
c) 1 g of Li (s) Atomic mass of Li = 7 d) 1 g of Mg (s) Atomic mass of Mg = 24

Solution : -

Atomic mass of Li = 7
(1) No.of atoms of O_2(g) = $\frac{1}{32} \times 2 \times N_A$
(2) No. of atoms of Li (s) = $\frac{1}{7} \times N_A$
(3) No. of atoms of Ag(s) = $\frac{1}{108} \times N_A$
(4) No. of atoms of Mg (s) = $\frac{1}{24} \times N_A$
$\therefore$ 1 g of Li has maximum number of atoms.

2. Mole fraction of the solute in a 1.00 molal aqueous solution is :

a) 0.0177 b) 0.0344 c) 1.7700 d) 0.1770

Solution : -

Mole fraction of a solute
= $\frac{Number\ of\ moles\ of\ solute}{Total\ number\ of\ moles\ of\ solute\ and\ solvent}$
Now, 1 molal aqueous solution means 1 mole of solute in 1000 g of water.
Number of moles of water in 1000 g
= $\frac{1000g}{18gmol^{-1}}$ = 55.56 mol
Thus, mole fraction of solute
= $\frac{Number\ of\ moles\ of\ solute}{Number\ of\ moles\ of\ solute}$ + Number of moles of water
=1/1 + 55.56
= 0.0177

3. Which of the following rules regarding the significant figures and calculations involving them is not correct?

a)
The result of an addition or subtraction is reported to the same number of decimal places as present in number with least decimal places
b)
Result of multiplication or division should have same number of Significant figures as present in most precise figure.
c)
The result of multiplication or division should be rounded off to same number of significant figures as present in least precise figure.
d) The non-significant figures in the measurements are rounded off.

Solution : -

Answer to a multiplication or division is rounded off to the same number of significant figures as possessed by the least precise term in the calculation.

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

a) 27.9 b) 159.6 c) 79.8 **d) 55.8**

Solution : -

$Z_2O_3 + 3H_2 \longrightarrow 2Z + 3H_2O$

Let the atomic weight of the metal Z be x.

Molecular mass of Z_2O_3 = 2x + 3 (16)

= 2x + 48 g mol^{-1}

Number of moles of 0.1596 g of Z_2O_3 = $\frac{0.1596}{2x+48}$ mol

Number of moles of 6 mg or 0.006 g of H_2 = $\frac{0.006}{2}$ = 0.003 mol

According to the balanced chemical equation, the molar ratio of Z_2O_3 and H_2 should be 1 : 3.

Thus, $\left(\frac{0.1596}{2x+48}\right)\left(\frac{1}{0.003}\right) = \frac{1}{3}$

⇒ 159.6 = 2x + 48 ⇒ 111.6 = 2x

⇒ x = 55.8 g mol^{-1}

5. The number of significant figures for the three numbers 161 cm, 0.161 cm, 0.0161 cm are:

a) 3, 4 and 5 respectively b) 3, 4 and 4 respectively c) 3, 3 and 4 respectively

d) 3, 3, and 3 respectively

Solution : -

(i) All non zero digits are significant.

(ii) Non zero digits to the right of the decimal point are significant.

(iii) Zeroes to the left of the first non-zero digits in a number are not significant.

So, the number of significant figures for the numbers 161 cm, 0.161 cm and 0.0161 cm are same i.e., 3

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

a) 1.4 b) 3.0 **c) 2.8** d) 4.4

Solution : -

$HCOOH \xrightarrow[H_2SO_4]{Dehydrating\ agent} CO + H_2O$

(H_2O absorbed by H_2SO_4)

Initial moles = $\frac{2.3}{46} = \frac{1}{20} \longrightarrow 0 + 0$

Final moles = $0 \longrightarrow \frac{1}{20} + \frac{1}{20}$

$H_2C_2O_4 \xrightarrow{H_2SO_4} CO + CO_2 + H_2O$

[H_2O absorbed by H_2SO_4]

Initial moles = $\frac{4.5}{90} = \frac{1}{20} \longrightarrow 0 + 0 + 0$

Final moles = $0 \longrightarrow \frac{1}{20} + \frac{1}{20} + \frac{1}{20}$

CO_2 is absorbed by KOH, so the remaining product is only CO.

Moles of CO formed from both reactions,

$= \frac{1}{20} + \frac{1}{20} = \frac{1}{10}$

Remaining mass of CO = Moles x Molar mass

So, = $\frac{1}{10}$ x 28 = 2.8

7. In the reaction, $4NH_3\ (g) + 5O_2\ (g) \longrightarrow 4NO\ (g) + 6H_2O\ (l)$ When 1 mole of ammonia and 1 mole of O_2 are made to react to completion, then:

a) 1.0mole of H_2O is produced b) 1.0mole of NO will be produced **c) all the oxygen will be consumed**

d) all the ammonia will be consumed

Solution : -

According to the given equation, if the initial volume of NH_3 and O_2 both are same, i.e., 1 mole then O_2 is limiting reagent.

$4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O$

	$4NH_3$	+ $5O_2$	→ $4NO$	+ $6H_2O$
Initial	1 mole	1 mole	0	0
Final	0.8	1	0.8 mole	1.2 mole

Thus, all the oxygen gas is consumed in the reaction.

8. The mass of one mole of a substance in grams is called its

a) molecular mass **b) molar mass** c) Avogadro's mass d) formula mass

Solution : -

The mass of one mole of a substance in a gram is called its molar mass.

9. What will be the molarity of the solution in which 0.365 g of HCI gas is dissolved in 100 mL of solution?

a) 2 M b) 0.2 M c) 1 M **d) 0.1 M**

Solution : -

No. of moles in 0.365 g of HCI = $\frac{0.365}{36.5} = 0.01$

Volume of solution in L = $\frac{100}{1000} = 0.1L$

Molarity = $\frac{n}{V(in \quad L)} \frac{0.01}{0.1} = 0.1M$

10. Two students performed the same experiment separately and each one of them recorded two readings of mass which are given below. Correct reading of mass is 3.0 g. On the basis of given data, mark the correct option out of the following statements.

Student	Readings	
	(i)	(ii)
A	3.01	2.99
B	3.05	2.95

a) Results of both the students are neither accurate nor precise.

b) Results of student A are both precise and accurate.

c) Results of student B are neither precise nor accurate.

d) Results of student B are both precise and accurate.

Solution : -

Student A

Average reading = $\frac{3.01+2.99}{2} = 3.0g$

Student B : Average reading = $\frac{3.05+2.95}{2} = 3.0g$

For both the students A and B, average reading is close to the correct reading (i.e.,3.0g). Hence, both recorded by student A are more precise as they differ only by ±0.01, whereas readings recorded by the student B are differ by ±0.05. Thus, the results of student A are both precise and accurate.

Precision refers to the closeness of various measurements for the same quantity and accuracy is the agreement of a perticular value to the true value of the results. Results of student A are very close to 3g.

11. What will be the weight of CO having the same number of oxygen atoms as present in 22 g of CO_2?

a) 28 g b) 22 g c) 44 g d) 72 g

Solution : -

No. of O atoms in CO_2= 2

Molar mass of CO_2 = 44 g

44 g $\equiv$ 1 mol $\Rightarrow$ 22 g $\equiv$ 0.5 mol

1 mole of CO_2 contains = 2 x 6.023 X 10^{23} O atoms

0.5 mole of CO_2 = 6.023 X 10^{23} O atoms

1 mole of CO = 6.023 x 10^{23} O atoms

Mass of 1 mole of CO = 12 + 16 = 28 g

12. If 500 mL of a 5 M solution is diluted to 1500 ml, what will be the molarity of the solution obtained?

a) 1.5 M **b) 1.66 M** c) 0.017 M d) 1.59 M

Solution : -

$M_1V_1 = M_2V_2$

5 M x 500 mL = M_2 x 1500 mL

$\therefore M_2 = \frac{5 \times 500}{1500} = 1.66M$

13. The number of moles of oxygen in 1 L of air containing 21%oxygen by volume, under standard conditions, is :

a) 0.0093 mole b) 2.10 moles c) 0.186 mole d) 0.21 mole

Solution : -

1 L of air contains 21% oxygen by volume.
So, volume of oxygen = $\frac{21}{100}$ x 1 L = 0.21 L
Now, at STP, 22.4 L of oxygen gas contains 1 mole
So, 0.21 L of oxygen gas contains = $\frac{1}{22.4}$ x 0.21 mol
= 9.3 x 10^{-3} mol
= 0.0093 mol

14. If the density of a solution is 3.12 g mL^{-1}, the mass of 1.5 mL solution in significant figures is________.
a) 4.7 g b) 4680 x 10^{-3} g c) 4.680 g d) 46.80 g

Solution : -
Density = $\frac{Mass}{volume}$
∴ Mass = Density x Volume
= 3.12 g mL^{-1} x 1.5 mL = 4.68 g = 4.7 g

15. An element, X has 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 :
a) 201 amu b) 202 amu c) 199 amu **d) 200 amu**

Solution : -
Contribution of ^{200}X in average atomic weight
= 0.90 x 200
= 180.00 amu
Contribution of ^{199}X in average atomic weight
= 0.08 x 199
= 15.92amu
Contribution of ^{202}X in average atomic weight
= 0.02 x 202
= 4.04 amu
Thus, weighted average atomic mass of X
= (180.00 + 15.92 + 4.04) amu
= 199.96 amu
≈ 200 amu

16. 1 g of Mg is burnt in a closed vessel containing 0.5 g of O_2.Which reactant is limiting reagent and how much of the excess reactant will be left?
a) 0_2 is a limiting reagent and Mg is in excess by 0.25 g. b) Mg is a limiting reagent and is in excess by 0.5 g.
c) 0_2 is a limiting reagent and is in excess by 0.25 g.
d) 0_2 is a limiting reagent and Mg is in excess by 0.75 g.

Solution : -
$$\underset{2\times24}{2Mg} + \underset{2\times16}{O_2} \longrightarrow \underset{2(24+16)}{2Mgo}$$
48 g of Mg requires 32 g of O_2
1 g of Mg requires $\frac{32}{48}$ = 0.66 g of O_2
Oxygen available = 0.5 g
Hence, 0z is limiting reagent.
32 g of 0z reacts with 48 g of Mg
0.5 g of 0z will react with $\frac{48}{32}$ x 0.5 = 0.75 g of Mg
Excess of Mg = (1.0 - 0.75) = 0.25 g

17. In an experiment, 2.4 g ofiron oxide on reduction with hydrogen gave 1.68 g of iron. In another experiment, 2.7 g of iron oxide gave 1.89 g of iron on reduction. Which law is illustrated from the above data?
a) Law of constant proportions b) Law of multiple proportions c) Law of reciprocal proportions
d) Law of conservation of mass

Solution : -

In first experiment,
Mass of iron oxide = 2.4 g
Mass of iron = 1.68 g
Mass of oxygen = 2.4 - 1.68 = 0.72
Ratio of masses of iron and oxygen = $\frac{1.68}{0.72} = 7 : 3$
In second experiment,
Mass of iron oxide = 2.7 g
Mass of iron = 1.89 g
Mass of oxygen = 2.7 - 1.89 = 0.81
Ratio of masses of iron and oxygen = $\frac{1.89}{0.81} = 7 : 3$
The same ratio confirms that these experiments clarify Law of constant proportions.

18. Specific volume of cylindrical virus particle is 6.02×10^{-2} cc/gm. Whose radius and length 6 A respectively. If N_A = 6.02×10^{23}, find molecular weight of virus
a) 3.08×10^3 kg/mol b) 3.08×10^4 kg/mol c) 1.54×10^4 kg/mol **d) 15.4 Kg/mol**

Solution : -
Given specific volume (volume of 1 gm) of cylindrical virus particle
= 6.02×10^{-2} cc/gm
and radius of virus
$= 7\ AA = 7 \times 10^{-8}$ cm
$\because 1\ AA = 10^{-8}$ cm
Length of virus = 10×10^{-8} cm
Then volume of virus $= \pi r^2 l$ (i)
Put the value in (i)
$\pi r^2 l = \frac{22}{7} \times \left(7 \times 10^{-8}\right)^2 \times 10 \times 10^{-8}$
= $\frac{\text{volume}}{\text{specific volume}}$
= $\frac{154 \times 10^{-23}}{0.02 \times 10^{-2}} \times 6.02 \times 10^{23}$
= 15400 g/mol =15.4 kg/mol

19. Chlorine gas is prepared by reaction of H_2SO_4 with MnO_2 and NaCl. What volume of Cl_2 will be produced at STP if 50 g of NaCl is taken in the reaction?
a) 1.915 L b) 22.4 L c) 11.2 L **d) 9.57 L**

Solution : -
$2NaCl + MnO_2 + 3H_2SO_4 \rightarrow 2NaHSO_4 + MnSO_4 + Cl_2 + 2H_2O$
2 moles 1 mole
(2×58.5 = 117 g) 22.4 L (STP)
117g of NaCl $\equiv$ 22.4L of Cl_2
50g of NaCl $\equiv \frac{22.4}{117} \times 50$ = 9.57L of Cl_2 at STP

20. **Assertion**: Scientific notation for the number 100 is expressed as 1×10^2.
Reason: The number 1×10^2 has two significantfigures
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

Solution : -
The terminal zeros are not Significant if there is no decimal point. Hence, the number 1×10^2 has only one Significant figure.

21. Match the column I with column II and mark the appropriate choice

	Column - I		Column - II
(A)	Mass of H_2 produced when 0.5 mole of zinc reacts with excessof HCl	(i)	3.01×10^{23} molecules
(B)	Mass of all atoms of a compound with formula C70H_{22}	(ii)	6.023×10^{23} molecules

	Column - I		Column - II
(C)	Number of molecules in 35.5 g of Cl_2	(iii)	1.43×10^{-21}g
(D)	Number of molecules in 64 g of SO_2	(iv)	1g

a) (A) $\rightarrow$ (ii), (B) $\rightarrow$ (i), (C) $\rightarrow$ (iv), (D) $\rightarrow$ (iii)   b) (A) $\rightarrow$ (i), (B) $\rightarrow$ (ii), (C) $\rightarrow$ (iii), (D) $\rightarrow$ (iv)

c) (A) $\rightarrow$ (iv), (B) $\rightarrow$ (iii), (C) $\rightarrow$ (i), (D) $\rightarrow$ (ii)   d) (A) $\rightarrow$ (iv), (B) $\rightarrow$ (iii), (C) $\rightarrow$ (ii), (D) $\rightarrow$ (i)

Solution : -

Zn + 2HCl $\rightarrow$ ZnCl2 + H_2

1 mole of Zn produces 2 g of H_2

0.5 mole of Zn will produce 1 g of H_2.

(B): $C_{70}H_{22}$

Molar mass = 862

Mass of atoms = 862/6.023 x 10^{23}= 1.43 X 10^{-21}g

(C) : 71 g of Cl_2 = 6.023 x10^{23}molecules

35.5 g of Cl_2 = 3.01 x10^{23}molecules

(D) : Molar mass of S02 = 64 = 1 mole

64 g of SO_2 = 6.023 x 10^{23}molecules

22. What will be the answer in appropriate significant figures as a result of addition of 3.0223 and 5.041?

a) 80.633   b) 8.0633   **c) 8.063**   d) 806.33

Solution : -

  3.0223
+ 5.041

  8.0633

Since, 5.041 has only 3 digits after the decimal point, the result should be reported to 3 digits after decimal point.

23. Which has maximum number of molecules?

a) 7 g N_2 **b) 2 g H_2**   c) 16 g NO_2 d) 16 g O_2

Solution : -

Different gases with the same number of moles have the same no. of molecules which is equal to the Avogadro's number i.e., 6.022 $\times 10^{23}$

Explanation

Number of moles,

step 1: the number of moles of 7gN_2,

Molar mass of N_2 = 28g/mol

$$\text{Number of moles } = \frac{\text{W eight of } N_2}{\text{Molecular weight of } N_2} = \frac{7}{28} = 0.25\text{moles}$$

Step 2: the number of moles 2 gH_2,

Molar mass of H_2=2g/mol

$$\text{Number of moles } = \frac{\text{W eight of } H_2}{\text{Molecular weight of } H_2} = \frac{2}{2} = 1 \text{ mole}$$

Step 3: the number of moles of 16gNO_2,

Molar mass of NO_2=14+2$\times$16=46g/mol

$$\text{Number of moles } = \frac{\text{W eight of } NO_2}{\text{Molecular weight of } NO_2} = \frac{16}{46} = 0.347\text{moles}$$

Step 4: the number of moles of 7gO_2,

Molar mass of O_2=2$\times$16=32g/mol

$$\text{Number of moles } = \frac{\text{W eight of } O_2}{\text{Molecular weight of } O_2} = \frac{16}{32} = 0.5\text{moles}$$

Thus, H_2 has the maximum number of moles, hence it has maximum number of molecules.

24. What is the mass per cent of oxygen in ethanol?

a) 52.14%   b) 13.13%   c) 16%   **d) 34.73%**

Solution : -

Molecular formula of ethanol = C_2H_5OH
Molar mass of ethanol = 2 x 12.01 + 6 x 1.008 + 16
= 46.068 g
Mass per cent of oxygen = $\frac{16}{46.068} \times 100$ = 34.73%

25. **Assertion :** One atomic mass unit is defined as one twelfth of the mass of one carbon -12 atom.
Reason : Carbon-12 isotope is the most abundant isotope of carbon and has been chosen as standard.
One atomic mass unit is defined as one twelfth of the mass of one carbon - 12 atom.
a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion
b) Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion
c) Assertion is correct but Reason is incorrect d) Both Assertion and Reason are incorrect

Solution : -
One atomic mass unit is defined as one-twelfth of the mass of one carbon - 12 atom because C-12 is chosen as the standard atom. This is because it has the equal number of protons and neutrons (6) and constitutes most of the matter.
The most abundant isotope of carbon is Carbon - 12.
Thus both Assertion and Reason are correct and Reason is the correct explanation of the Assertion.

26. Chemical reactions involve interaction of atoms and molecules. A large number of atoms/molecules (approximately 6.023 x 10^{23}) are present in a few grams of any chemical compound varying with their atomic/molecular masses. To handle such large numbers conveniently, the mole concept was introduced. This concept has implications in diverse areas such as analytical chemistry, biochemistry, electrochemistry and radiochemistry. The following example illustrates a typical case, involving chemical! electrochemical reaction, which requires a clear understanding of the mole concept.
A 4.0 molar aqueous solution of NaCl is prepared and 500 mL of this solution is electrolysed. This leads to the evolution of chlorine gas at one of the electrodes (atomic mass: Na = 23, Hg = 200; lfaraday = 96500 coulombs). If the cathode is a Hg electrode, the maximum weight (g) of amalgam formed from this solution is
a) 200 b) 225 c) 400 **d) 446**

Solution : -
Number of moles of Na^+ = 2
2NaCl $\equiv$ 2Na
$$\underset{2}{Na} + \underset{2}{Hg} \longrightarrow \underset{2}{Na(Hg)}$$
By electrolysis we can get a maximum of 2 moles of sodium which can combine with exactly 2 moles of mercury to give 2 moles of amalgam.
$\therefore$ Maximum weight of Na amalgam (assuming equimolar Na and Hg) = 46 + 400 = 446 g.

27. In which case is the number of molecules of water maximum?
a) 18 mL of water b) 0.18 g of water c) 0.00224 L of water vapours at 1 atm and 273 K
d) 10^{-3} mol of water

Solution : -
The maximum number of water molecules corresponds to the maximum number of moles of water.
0.00224 L of water vapours at 1 atm and 273 K corresponds to :
$$\mathrm{n} = \frac{\mathrm{PV}}{\mathrm{RT}} = \frac{1\ \mathrm{atm} \times 0.00224\ \mathrm{L}}{0.08206\ \mathrm{L\ atm/molK} \times 273\ \mathrm{K}} = 1.07 \times 10^{-4}\ \mathrm{mol}$$
18mL of water (density 1 g/mL) corresponds to :
$$18\ \mathrm{mL} \times \frac{1\ \mathrm{g/mL}}{18\ \mathrm{g/mol}} = 1\ \mathrm{mol}$$
0.18g of water corresponds to :
$$\frac{0.18\ \mathrm{g}}{18\ \mathrm{g/mol}} = 0.01\ \mathrm{mol}$$
18 mL of water has maximum number of moles which corresponds to maximum number of molecules$$.

28. 6.02 X 10^{20} molecules of urea are present in 100 mL of its solution. The concentration of solution is :
a) 0.02 M **b) 0.01 M.** c) 0.001 M d) 0.1 M

Solution : -

6.023×10^{23} molecules of urea are present in 1 mole.
6.023×10^{20} molecules of urea are present in
(1 mole / 6.023) x 10^{23} x 6.023 X 10^{20}= 10^{-3} moles
Volume of solution = 100 mL = 0.1 L
Molarity of urea solution = No. of moles of urea/Volume of solution
=10^{-3} moles/0.1 L
= 10^{-2} or 0.01 mol L^{-1} or 0.01 M

29. Which set of figures will be obtained after rounding up the following up to three significant figures?
34.216,0.04597, 10.4107
a) 34.3,0.0461,10.4 **b) 34.2, 0.0460, 10.4** c) 34.20,0.460,10.40 d) 34.21,4.597, 1.04

Solution : -
To round up a given number, ignore the last digit as such if the digit next to it is less than 5. Then increase it by 1, if the next digit is greater than 5.
(i) 34.216
34.22 { since next digit (6) is greater than 5 }
34.2 {since next digit (2) is less than 5 }
(ii) 0.04597
0.0460 {since next digit (7) is greater than 5}
(iii) 10.4107
10.411 { since next digit (7) is greater than 5}
10.41 { since next digit (1) is less than 5}
10.4 { since next digit (1) is less than 5}

30. **Assertion:** Components of a homogeneous mixture cannot be separated by using physical methods.
Reason : Composition of homogeneous mixture is uniform throughout as the components react to form a single compound.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. **d) If both assertion and reason are false.**

Solution : -
In homogeneous mixture, the components completely mix with each other and hence the composition is uniform throughout. Formation of homogeneous mixture is a physical change as no chemical reaction occurs between the components and no new compound is formed, hence the components can be separated by physical methods.

31. A mixture of gases contains of H_2 and O_2 gases in the ratio of 1: 4 (w/w). What is the molar ratio of the two gases in the mixture?
a) 4: 1 b) 16: 1 c) 2: 1 d) 1: 4

Solution : -
A mixture of gases contains H_2 and O_2 gases in the ratio of 1 : 4 (w/w).
Let 100 g of hydrogen and 400 g of oxygen are present.
The molar masses of hydrogen and oxygen are 2 g/mol and 32 g/mol respectively.
The number of moles of hydrogen present are $\frac{100}{2}$=50 mol.
The number of moles of oxygen present are $\frac{400}{32}$=12.5 mol.
The molar ratio of the two gases in the mixture is 50 : 12.5 or 4 : 1.

32. Boron has two stable isotopes, ^{10}B (19%) and ^{11}B (81%). Average atomic weight for boron in the periodic table is:
a) 10.8 b) 10.2 c) 11.2 d) 10.0

Solution : -
$$\text{Average atomic weight } = \frac{\sum \% \text{ abundant } \times \text{ atomic mass}}{100}$$
$$= \frac{19 \times 10 + 81 \times 11}{100} = 10.81$$

33. Mark the rule which is not correctly stated about the determination of significant figures.

a) Zeros preceding to first non-zero digit are not significant.

b) Zeros preceding to first non-zero digit are not significant.

c) Zeros at the end or right of the number are significant if they are on the right side of decimal point.

d) All non-zero digits are significant.

34. **Assertion:** Solids have definite volume and shape.

Reason: In solids, the constituent particles are very close to each other and there is not much freedom of movement

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion

c) If assertion is true but reason is false. d) If both assertion and reason are false.

Solution : -

Solids have definite volume and shape because the constituent particles are very close to each other and there is not much freedom of movement. Both Assertion and Reason are correct and related.

35. 1.4 moles of phosphorus trichloride are present in a sample. How many atoms are there in the sample?

a) 5.6 b) 34 c) 2.4×10^{23} **d) 3.372×10^{24}**

Solution : -

1 mol $PCl_3 = 6.022 \times 10^{23}$ molecules

1.4 mol $PCl_3 = 1.4 \times 6.022 \times 10^{23} = 8.43 \times 10^{23}$ molecules

Number of atoms present in 1 molecule of $PCl_3 = 4$

Number of atoms in 8.43×10^{23} molecules of $PCl_3 = 4 \times 8.43 \times 10^{23}$ atoms

$= 33.72 \times 10^{23}$

$= 3.372 \times 10^{24}$ atoms

36. Which of the following options is not correct?

a) 2.300 + 0.02017 + 0.02015 = 2.340 b) 126, 000 has 3 Significant figures c) 15.15 μs = 1.515×10^{-5} s

d) 0.0048 = 48×10^{-3}

Solution : -

2.300+0.02017+0.02015=2.3432

Rule: The result of an addition or subtraction is reported to the same number of decimal places as present in number with the least decimal places.

Since the least precise number is 2.300 and that has three digits after the decimal, therefore the result of the above addition is rounded off to three decimal figures as 2.340.

126,000 has 3 significant figures as zeros are not counted

15.15μs=15.15×10^{-6}s= 1.515×10^{-5}s

$0.0048 = 4.8 \times 10^{-3}$

37. 0.24 g of a volatile gas. upon vapourisation. gives 45 mL, vapour at NTP. What will be the vapour density of the substance? (Density of $H_2 = 0.089$)

a) 95.93 **b) 59.93** c) 95.39 d) 5.993

Solution : -

Weight of gas = 0.24 g

Volume of gas (V) = 45 mL = 0.045 L

Density of H_2(d) = 0.089

Weight of 45 mL of H_2 = V x d = 0.045 x 0.089

= 4.005, 10^{-3} g

Therefore, vapour density

$$= \frac{\text{Weight of certain volume of substance}}{\text{Weight of same volume of hydrogen}}$$

$$= \frac{0.24}{4.005 \times 10^{-3}} = 59.93$$

38. What quantity of copper oxide will react with 2.80 L of hydrogen at NTP?

a) 79.5 g b) 2 g **c) 9.9 g** d) 22.4 g

Solution : -

$$\underset{79.5g}{CuO} + \underset{22.4L}{H_2} \longrightarrow Cu + H_2O$$

22.4 L of $H_2 \equiv$ 79.5 g of CuO

2.80 L of $H_2 \equiv \frac{79.5}{22.4} \times 2.80$ = 9.9 g of CuO

39. In a mixture of gases, the volume content of a gas is 0.06% at STP. Calculate the number of molecules of the gas in 1 L of the mixture.

a) 1.613 x 10^{23} b) 6.023 x 10^{23} c) 1.61 x 10^{27} **d) 1.61 x 10^{19}**

Solution : -

Volume of gas in 1 L = $\frac{0.06}{100} = 6 \times 10^{-4} L$

Number of molecules of CO_2 = n x N_A

$\frac{6 \times 10^{-4}}{22.4}$ x 6.023 x 10^{23} = 1.61 x 10^{19}

40. An organic compound on analysis gave the following results: C = 54.5%, O = 36.4%, H = 9.1%. The Empirical formula of the compound is

a) CHO_2 b) CH_2O c) C_2H_8O **d) C_2H_4O**

Solution : -

Element	%	No.of moles	Mole radio	Whole no.radio
C	54.5	54/12 = 4.54	4.54/2.27	2
H	9.1	9.1/1=9.1	9.1/2.27	4
O	36.4	36.4/16=2.27	2.27/2.27	1

Hence Empirical formula of the compound is C_2H_4O.

41. What will be the molality of chloroform in the water sample which contains 15 ppm chloroform by mass?

a) 1.25 x 10^{-4} m b) 2.5 x 10^{-4} m c) 1.5 x 10^{-3} m d) 1.25 x 10^{-5} m

Solution : -

15 ppm = $\frac{15}{10^6} \times 10^2 = 1.5 \times 10^{-3} g$

Molality of $CHCl_3$ solution = $\frac{1.5 \times 10^{-3}}{100} \times \frac{1000}{119.5}$

= 1.25 x 10^{-4}m

42. **Assertion:** The mass of a substance is constant whereas its weight may vary from one place to another.

Reason : Mass of a substance is the amount of matter present in it while weight is the force exerted by gravity on an object.

a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion

b) Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion

c) Assertion is correct but Reason is incorrect d) Both Assertion and Reason are incorrect

Solution : -

The weight of a substance may vary from one place to another due to change in gravity but mass of any substance remains the same.

43. The number of water molecules is maximum in:

a) 1.8 gram of water b) 18 gram of water **c) 18 moles of water** d) 18 molecules of water

Solution : -

Molecular mass of water is 18 g/mole So, 1 mole or 18 g of water contains 6.023 x 10^{23} molecules.

1.8g of water contains = $\frac{6.023 \times 10^{23} \times 1.8\, molecules}{18}$

= 6.023 x 10^{22} molecules

18 moles of water contain 6.023 x 10^{23} x 18 molecules.

Thus, 18 moles of water contain maximum number of molecules.

44. Which of the following is dependent on temperature?

a) Molality **b) Molarity** c) Mole fraction d) Weight percentage

Solution : -

Molality = $\frac{Number\ of\ moles\ of\ solute}{Mass\ of\ solvent\ (in\ kg)}$

Mole fraction = $\frac{Number\ of\ moles\ of\ solute}{Volume\ of\ solution\ (in\ L)}$

Weight percentage = $\frac{Weight\ of\ acomponent}{Total\ weight\ of\ solution}$ x 100

Among the above concentration units, only molarity depends on the volume of the solution which increases with increasing temperature and decreases with decreasing temperature. Rest of the three terms either depends on number of components or weight of components which are independent of temperature.

45. How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 M HNO_3? The concentrated acid is 70% HNO_3.

a) 45.0 g conc. HNO_3 b) 90.0 g conc. HNO_3 c) 70.0 g conc. HNO_3 d) 540 g conc. HNO_3

Solution : -

Molarity of a solution = $\frac{Mass\ o\ fsolute}{Molecular\ weight\ of\ solutex\ Volume(\ in\ L)}$

Let mass of HNO_3 in solution be m.

Molarity of HNO_3 solution = 2

Molecular weight of HNO_3 = 1 + 14 +3 (16)

= 63 g mol^{-1}

Volume of solution = 250 mL = 0.25 L

Thus, putting these values in eqn. (i), we get

2 = $\frac{m}{63\times0.25}$ ⇒ m =2 x 63 x 0.25

m = 31.5 g

Now, if concentrated HNO_3 is 100% then it requires 31.5 g.

But the original solution of HNO_3 is 70% concentrated. Hence, the mass of HNO_3 required to produce 2.0M solution = $\frac{100}{7}$ x 31.5 g

= 45.0 g of HNO_3

46. What is the mass of carbon dioxide which contains the same number of molecules as are contained in 40 g of oxygen?

a) 40 g **b) 55 g** c) 32 g d) 44 g

Solution : -

Molar mass of O_2 = 32 g mol^{-1}

32 g of O_2 = 6.023 x 10^{23} molecules

40 g of O_2 = $\frac{6.023\times10^{23}\times40}{32} = 7.529\times10^{23}$ molecules

Mass of 6.023 x 10^{23} molecules of CO_2 = 44 g

Mass of 7.529 x 10^{23} molecules of CO_2 = $\frac{44\times7.529\times10^{23}}{6.023\times10^{23}} = 55$ g

47. The density of a gas is 1.78 g L^{-1} at STP. The weight of one mole of a gas is

a) 39.9 g b) 22.4 g c) 3.56 g d) 29 g

Solution : -

Density = 1.78 gL^{-1} at STP

mass of 1 L gas = 1.78 g

1 mol of gas at STP = 22.4 L

$\therefore$ mass of 22.4 L gas = 22.4 $\times$ 1.78 = 39.872 g

48. Which of the following correctly represents 180 g of water?

(i) 5 moles of water

(ii) 10 moles of water

(iii) 6.023 x 10^{23}molecules of water

(iv) 6.023 x 10^{24}molecules of water

a) (i) b) (ii) c) (iii) **d) (iv)**

Solution : -

18 g of H_2O = 1 mol
180 g of H_2O = 10 mol
18 g of H_20 = 6.023 X 10^{23} molecules of H_2O
180 g of H_2O = $\frac{6.023\times10^{23}}{18}$ x 180
= 6.023 x 10^{24} molecules of H_2O

49. Mark the conversion factor which is not correct.
    a) 1 atm = 1.01325 x 10^5 Pa b) 1 metre = 39.37 inches c) 1 litre = 10^{-3} m^3 **d) 1 inch = 3.33 cm**

50. What is the concentration of copper sulphate (in mol L^{-1}) if 80 g of it is dissolved in enough water to make a final volume of 3L?
    a) 0.0167 **b) 0.167** c) 1.067 d) 10.67

    Solution : -
    Molar mass of $CuS0_4$ = 63.5 + 32 + 64 = 159.5
    Moles of$CuS0_4$ = $\frac{80}{159.5} = 0.50$
    Volume of solution = 3 L
    Molaruty = $\frac{mole\ of\ solute}{Volume\ of\ solution\ in\ L} = \frac{0.50}{3}$ = 0.167 mol L^{-1}