KD EDUCATION ACADEMY [9582701166]

Time : 6 Hour | STD 11 Science Chemistry | Total Marks : 120

kd 90+ Questions ch-1 some basic concepts of chemistry

* **Choose The Right Answer From The Given Options.[1 Marks Each]** **[67]**

1. What will be the molarity of a solution, which contains 5.85g of NaCl(s) per 500mL?

(A) 4mol L^{-1} (B) 20mol L^{-1} (C) 0.2mol L^{-1} (D) 2mol L^{-1}

Ans. :

c. 0.2mol L^{-1}

Explanation:

$$\mathrm{M} = \frac{\text{no. of moles of solute}}{\text{Volime of solution in L}}$$

$$= \frac{\frac{5.85}{58.5}}{0.5\mathrm{L}} = \frac{0.1}{0.5} = 0.2 \text{ mol } \mathrm{L}^{-1}$$

2. 18 carat gold contains ?

(A) 18% gold (B) 4% gold (C) 75% gold (D) 60% gold

Ans. :

c. 75% gold

Explanation:

Caratage is the measurement of purity of gold alloyed with other metals. 24 carat is pure gold with no other metals. Low caratages contain less gold. 18 carat gold contain 75% of gold & 25% of other metals often, Copper/ Silk.

3. Who is given the credit for creation of first nuclear reactor.

(A) Fermi (B) Niels Bohr (C) Einstein (D) openheimer

Ans. :

a. Fermi

4. Cortisone is a molecular substance containing 21 atoms of carbon per molecule. The mass percentage of carbon in cortisone is 69.98%. It's molar mass is:

(A) 176.5 (B) 252.2 (C) 287.6 (D) 360.1

Ans. :

d. 360.1

Explanation:

Let molar mass be = M

Mass of 21 carbon atoms = 252

% of carbon $= \frac{252 \times 100}{\mathrm{M}} = 69.98$

but % of carbon = 69.98 %

$\therefore$ M = 360.1

5. What is the mass percent of carbon in carbon dioxide?

(A) 0.034% (B) 27.27% (C) 3.4% (D) 28.7%

Ans. :

b. 27.27%

Explanation:

$\text{Mass percent of C in } CO_2 = \frac{\text{Molar mass of carbon} \times 100}{\text{Molar mass of } CO_2}$

$\therefore \ \%\text{ of C in } CO_2 = \frac{12}{44} \times 100 = 27.27\%$

6. The National Physical Laboratory is situated at:

(A) Kolkata (B) New Delhi

(C) Bombay (D) None of these

Ans. :

b. New Delhi

Explanation:

The CSIR-National Physical Laboratory of India is situated in New Delhi.

It maintains standards of SI units in India and calibrates the national standards of weights and measures.

7. 1g of M_2CO_3 on treatment with excess HCl produces 0.01186 moles of CO_2 The molar mass of M_2CO_3 in g mor^{-1} is:

(A) 1186 (B) 84.3 (C) 118.6 (D) 11.86

Ans. :

b. 84.3

Explanation:

$M_2CO_3 + 2HCl \rightarrow 2MCl + H_2O + CO_2$

0.01186 mole of CO_2 is produced from 1g of M_2CO_3

1 mole of CO_2 is produced from $\frac{0}{0.01186} = 84.3\text{g of } M_2CO_3$

8. A sample of H_2SO_4 contains 3.2 kg of sulphur. The weight (in g) of hydrogen present in the sample is:

(A) 100 (B) 200 (C) 50 (D) 150

Ans. :

b. 200

Explanation:

In H_2SO_4 no of moles of hydrogen = 2 × no of moles of hydrogen. Now 3.2kg of sulphur = 3200g of sulphur = 100 moles of sulphur.

So, no fo moles of hydrogen = 200 moles. So weight of the hydrogen = (1 × 200) = 200gm.

9. Which of the following solutions have the same concentration?

(A) 20g of NaOH in 200mL of solution. (B) 0.5mol of KCl in 200mL of solution.

(C) 40g of NaOH in 100mL of solution. (D) 20g of KOH in 200mL of solution.

Ans. :

a. 20g of NaOH in 200mL of solution.

b. 0.5mol of KCl in 200mL of solution.

Explanation:

$\text{Molarity} = \frac{\text{w} \times 1000}{\text{M} \times \text{V(mL)}}$

a. $\text{Molarity} = \frac{20 \times 1000}{40 \times 200} = 2.5\text{M}$

b. $\text{Molarity} = \frac{0.5 \times 1000}{200} = 2.5\text{M}$

c. $\text{Molarity} = \frac{40 \times 1000}{(40 \times 100)} = 10\text{M}$

d. $\text{Molarity} = \frac{20 \times 1000}{(56 \times 200)} = 1.785\text{M}$

Thus (a) and (b) have the same molar concentration.

10. How many number of aluminium ions are present in 0.051g of aluminium oxide?

(A) 6.023×10^{23} ions.

(B) 3 ions.

(C) 6.023×10^{20} ions.

(D) 9 ions.

Ans. :

c. 6.023×10^{20} ions.

11. Which is the 1st organic compound synthesized in lab?

(A) Urea

(B) Methanol

(C) Ammonia

(D) Sulphuric Acid

Ans. :

a. Urea

Explanation:

It is widely accepted that urea is the first organic compound to be synthesized from inorganic chemicals. In 1828, the German chemist Friedrich Wöhler obtained urea artificially by treating silver cyanate with ammonium chloride.

12. Which of the following pairs have the same number of atoms?

(A) 16g of O_2(g) and 4g of H_2(g)

(B) 16g of O_2 and 44g of CO_2

(C) 28g of N_2 and 32g of O_2

(D) 12g of C(s) and 23g of Na(s)

Ans. :

c. 28g of N_2 and 32g of O_2

d. 12g of C(s) and 23g of Na(s)

Explanation:

c. Number of atom of carbon $= \frac{12}{12} \times 6.023 \times 10^{23}$

$= 6.023 \times 10^{23}$

Number of atoms of sodiam $\frac{23}{23} \times 6.023 \times 10^{23}$

$= 6.023 \times 10^{23}$

d. Number of atoms of carbon $= \frac{12}{12} \times 6.023 \times 20^{23}$

$= 6.023 \times 10^{23}$

Number of atoms of sodium $= \frac{23}{23} \times 6.023 \times 10^{23}$

$= 6.023 \times 10^{23}$

13. One mole of any substance contains 6.022×10^{23} atoms/ molecules. Number of molecules of H_2SO_4 present in 100mL of 0.02M H_2SO_4 solution is _____.

(A) 12.044×10^{20} molecules.

(B) 6.022×10^{23} molecules.

(C) 1×10^{23} molecules.

(D) 12.044×10^{23} molecules.

Ans. :

a. 12.044×10^{20} molecules.

Explanation:

We knew thet $\mathrm{M} = \frac{\mathrm{n}}{\mathrm{v}}$ or $\mathrm{n} = \mathrm{M} \times \mathrm{V}\ (\mathrm{in\ L})$

$\mathrm{n} = 0.02 \times 0.1 = 0.002$

No. of molecules $= \mathrm{n} \times 6.022 \times 10^{23}$

$= 0.002 \times 6.022 \times 10^{23} = 12.044 \times 10^{20}$ molecules

14. The solution of A and B are 0.1 and 0.2 molar in a substance. If 100ML of 'A' are mixed with 25mL of B and there is no change in volume, then the final molarity of solution is:

(A) 0.15M (B) 0.18M (C) 0.12M (D) 0.30M

Ans. :

c. 0.12M

Explanation:

$M_1V_1 + M_2V_2 = M \times V$

$0.1 \times 100 + 0.2 \times 25 = M \times 125$

$\Rightarrow \mathrm{M} = \frac{10+5}{125} = \frac{15}{125} = 0.12$

15. Who is considered as the founding father of chemistry?

(A) Boyle (B) Aristotle (C) Sir Francis (D) John Mayow

Ans. :

a. Boyle

Explanation:

Boyle, in particular, is regarded as the founding father of chemistry due to his most important work, the classic chemistry text - "The Sceptical Chymist" (1661), where the differentiation is made between the claims of Alchemy and the empirical scientific discoveries of the new chemistry.He formulated Boyle's law, rejected the classical "four elements" and proposed a mechanistic alternative of atoms and chemical reactions that could be subjected to rigorous experiments.

16. The mass of one mole a chloride formed by metal 'X' is 111.0g. Which one could be formula of chloride?

(A) XCl (B) XCl_2 (C) XCl_3 (D) XCl_4

Ans. :

b. XCl_2

Explanation:

∵ It is $CaCl_2 = 40 + 71 = 111.0\text{g mol}^{-1}$

17. The number of Cl^- and Ca^{2+} ions in 222g of $CaCl_2$ is:

(A) $4N_A$, $2N_A$ (B) $2N_A$, $4N_A$ (C) $1N_A$, $2N_A$ (D) $2N_A$, $1N_A$

Ans. :

a. $4N_A$, $2N_A$

Explanation:

222g of $CaCl_2$ is equal to 2 moles of $CaCl_2$.

Therefore, it has 2 moles of Ca^{2+} and 4 moles of Cl^{-}.

So, no. of atoms of Ca^{2+} and Cl^{-} are $2N_A$ and $4N_A$ respectively.

18. A measured temperature on Fahrenheit scale is 200°F. What will this reading be on Celsius scale?

(A) 40°C (B) 94°C (C) 93.3°C (D) 30°C

Ans. :

c. 93.3°C

Explanation:

$$^{\circ}\mathrm{F} = \frac{9}{5}(^{\circ}\mathrm{C}) + 32$$
$$200 = \frac{9}{5}(^{\circ}\mathrm{C}) + 32$$
$$(^{\circ}\mathrm{C}) = (200 - 32) \times \frac{5}{9}$$
$$(^{\circ}\mathrm{C}) = 93.3^{\circ}\mathrm{C}$$

19. When two molecules of hydrogen react with one molecule of oxygen, the mass of reactants is 36, what is the mass of products?

(A) 18 (B) 36 (C) 9 (D) 32

Ans. :

b. 36

Explanation:

The Law of conservation of mass states that the total mass of reactants is equal to the total mass of products. In any chemical reaction, the total mass of the substance before and after the reaction is the same although its matter undergoes a physical change.

$2H_2 + O_2 \longrightarrow 2H_2O$

20. Which of the following represents largest number of particles.

(A) Atoms in mole of CH_4 (B) Atoms in 0.5 mol of SO_3

(C) Atoms in 0.5 mole of CO_2 (D) Atoms in 1 mol of CO.

Ans. :

a. Atoms in mole of CH_4

Explanation:

I mole of $CH_4 = 5 \times 6.022 \times 10^{23}$,

0.5 mol of $SO_3 = 4 \times 0.5 \times 6.022 \times 10^{23}$,

0.5 mole of $CO_2 = 0.5 \times 3 \times 6.022 \times 10^{23}$,

I mole of $CO = 2 \times 6.022 \times 10^{23}$

21. The relative atomic masses of many elements are not whole numbers because:

(A) Of different natural abundance of different isotopes

(B) Of the concept average atomic masses

(C) Of the existence of isotopes

(D) All of these

Ans. :

d. All of these

22. Elements X, Y and Z have atomic numbers 5, 9 and 11 respectively. Which one forms an anion?

(A) X (B) Y

(C) Z (D) Both B and C

Ans. :

b. Y

Explanation:

Atomic number of X is 5 and electronic configuration is: 2, 3

Atomic number of Y is 9 and electronic configuration is: 2, 7

Atomic number of Z is 12 and electronic configuration is: 2, 8, 1

Y is one electron short of stable completely filled configuration and thus readily accepts one electron to form an anion.

23. An alkaloid contains 17.28% of nitrogen and its molecular mass is 162. The number of nitrogen atoms present in one molecule of alkaloid is:

(A) 5 (B) 4 (C) 3 (D) 2

Ans. :

d. 2

Explanation:

100g alkaloid contains nitrogen = 17.28g

$\therefore$ 162g alkaloid will contain nitrogen $= \frac{17.28 \times 162}{100} = 27.9\text{g} \simeq 28\text{g}.$

Atomic weight of nitrogen = 14

So, number of atoms of nitrogen present in one molecule of alkaloid $= \frac{28}{14} = 2.$

24. How many moles are present in 6.023×10^{22} molecules of CO_2?

(A) 0.2 (B) 0.01 (C) 0.1 (D) 0.02

Ans. :

c. 0.1

Explanation:

1 mole of CO_2 contains 1 NA molecules. (NA = 6.023×10^{23})

Moles present in given sample are: $6.023 \times 10^{22} \div$ NA = 0.1

25. An organic compound on analysis was found to contain 10.06% carbon, 0.84% hydrogen and 89.10% chlorine. What will be the empirical formula of the substance?

(A) CH_2Cl_2 (B) $CHCl_3$ (C) CCl_4 (D) CH_3Cl

Ans. :

b. $CHCl_3$

26. A solution is prepared by adding 2g of a substance A to 18g of water. Calculate the mass percent of the solute.

(A) 8% (B) 9% (C) 10% (D) 11%

Ans. :

c. 10%

27. 4.6×10^{22} atoms of an element weight 13.8g. What is the atomic mass of the element?

(A) 290u (B) 180.6u (C) 34.4u (D) 104u

Ans. :

b. 180.6u

Explanation:

1 mole of any substance contains 6.02 × 10^{23} atoms.

Thus, 4.6 × 10^{22} atoms corresponds to $\frac{4.6\times10^{22}}{6.022\times10^{23}} = 0.0764\ \text{Moles}$

0.0764 moles weighs 13.8g.

Thus, 1 mole will weigh $\frac{13.8}{0.0764} = 180.6\text{g}$

28. Arrange the following in the order of increasing mass (Atomic mass of O = 16, Cu = 63 and N = 14).

I. One atom of oxygen.
II. One atom of nitrogen.
III. 1 × 10-10 mole of oxygen.
IV. 1 × 10^{-10} mole of copper.

(A) II < I < III < IV. (B) I < II < III < IV.

(C) III < II < IV < I. (D) IV < II < III < I.

Ans. :

a. II < I < III < IV.

Explanation:

I. Mass of one atom of oxygen

$= \frac{16}{6.022\times10^{23}} = 2.66\times10^{-23}\text{g}$

II. Mass of one atom of nitrogen

$= \frac{14}{6.022\times10^{23}} = 2.32\times10^{-23}\text{g}$

III. Mass of 1 × 10^{-10} mole of oxygen = 16 × 10^{-10}g

IV. Mass of 1 × 10^{-10} mole of copper = 63 × 10^{-10}

Hence, masses of atoms in increasing order: II < I < III < IV.

29. 25cm^3 of oxalic acid completely neutrelised 0.064g of NaOH. Molarity of oxalic acid solution is:

(A) 0.064. (B) 0.045. (C) 0.015. (D) 0.032.

Ans. :

a. 0.032.

Explanation:

$$\begin{array}{l}\text{COOH}\\|\\\text{COOH}\end{array} + 2\text{NaOH} \longrightarrow \begin{array}{l}\text{COONa}\\|\\\text{COONa}\end{array} + 2\text{H}_2\text{O}$$

30. Active mass of 6% solution of compound X is 2. Molecular weight of X would be:

(A) 6 (B) 30 (C) 60 (D) 90

Ans. :

b. 30

Explanation:

Active mass of 2 means 2 moles of X in one litre solution.

∵ 100ml solution contains 6gm of X

∴ 1000ml solution contains 1006 × 1000 = 60gm

2 moles = 60gm X

1 mole = 30gm X

31. If the concentration of glucose ($C_6H_{12}O_6$) in blood is 0.9g L^{-1}, what will be the molarity of glucose in blood?

(A) 5M (B) 50M (C) 0.005M (D) 0.5M

Ans. :

c. 0.005M

Explanation:

Molar mass of glucose ($C_6H_{12}O_6$)

$= 12 \times 6 + 1 \times 12 + 16 \times 6 = 180$

$$\text{Molarity} = \frac{\text{conc. in gL}^{-1}}{\text{Molar mass}} = \frac{0.90\text{gL}^{-1}}{180\text{g mol}^{-1}} = 0.005\text{M}$$

32. The volume of 0.5M aqueous NaOH solution required to neutralize 10ml of 2M aqueous HC1solution is:

(A) 20ml (B) 40ml (C) 80ml (D) 120ml

Ans. :

b. 40ml

Explanation:

NaOH : HCl

$N_1V_1 = N_2V_2$

$0.5 \times V = 2 \times 10$

V = 40mL

33. When magnesium is burnt in air, the weight of magnesium:

(A) Increases (B) Decreases

(C) Remains same (D) Depends on the atmosphere

Ans. :

a. Increases

Explanation:

When magnesium is burnt in air, the weight of magnesium increases due to the formation of MgO.

$2Mg + O_2 \rightarrow 2MgO$

34. 16g of oxygen has same number of molecules as in:

(A) 16g of CO (B) 28g of N_2 (C) 14g of N_2 (D) 1.0g of H_2

Ans. :

c. 14g of N_2

d. 1.0g of H_2

Explanation:

Number of molecules of O_2 in 16g of O_2

$= \frac{16}{32} \times 6.023 \times 10^{23}$

$0.5 \times 6.023 \times 10^{23}$

0.5 moles in present in 14g N_2 and 1g H_2, hence these samples will also have (0.5 × 6,023 × 10^{23}) molecules.

Number of molecules of N_2

$= \frac{w}{mol.wt.} \times 6.023 \times 10^{23}$

$= \frac{14}{28} \times 6.023 \times 10^{23}$

$= 0.5 \times 6.023 \times 10^{23}$

Number of molecules of $H_2 = \frac{1}{2} \times 6.023 \times 10^{23}$

$= 0.5 \times 6.023 \times 10^{23}$

35. If 1mL of water contains 20 drops then number of molecules in a drop of water is:

(A) 6.023 × 10^{23} molecules. (B) 1.376 × 10^{26} molecules.

(C) 1.62 × 10^{21} molecules. (D) 4.346 × 10^{20} molecules.

Ans. :

c. 1.62 × 10^{21} molecules.

36. An organic compound containing C, H and O has 49.3% carbon, 6.84% hydrogen and its vapour density is 73. Molecular formula of the compound is:

(A) $C_3H_5O_2$ (B) $C_4H_{10}O_2$ (C) $C_6H_{10}O_4$ (D) $C_3H_{10}O_2$

Ans. :

c. $C_6H_{10}O_4$

Explanation:

Element	%	% atomic weight	Simplest ratio
C	92.3	$\frac{49.3}{12} = 4.1$	$\frac{4.1}{2.74} = 1.5 \times 2 = 3$
H	7.7	$\frac{6.84}{1} = 6.84$	$\frac{6.84}{2.74} = 2.5 \times 2 = 5$
O	43.86	$\frac{43.86}{16} = 2.74$	$\frac{2.74}{2.74} = 1 \times 2 = 2$

The empirical formula is $C_3H_5O_2$.

Empirical formula weight = 3 × 12 + 5 × 1 + 2 × 16

= 36 + 5 + 32 = 73

Molecular weight of the compound = 2 × VD = 2 × 73 = 146

$n = \frac{\text{mol. wt.}}{\text{empirical fromula wt.}} = \frac{146}{73} = 2$

Molecular formula = Empirical formula × 2

= ($C_3H_5O_2$) × 2=$C_6H_{10}O_4$

37. Chemistry is sometimes called as:

(A) Biological Science (B) Central Science

(C) Biochemistry (D) Both A and C

Ans. :

b. Central Science

Explanation:

Chemistry is sometimes called as Central Science because it bridges other natural sciences, including physics, geology and biology.

38. Which is the lightest element in the universe?

(A) Helium (B) Hydrogen (C) Nitrogen (D) Silicon

Ans. :

b. Hydrogen

Explanation:

Hydrogen is the lightest element in the universe with atomic number 1 and so, it has the simplest atomic structure.

39. At same temperature and pressure, equal volumes of gases contain the same number of:

(A) Molecules (B) Electrons (C) Protons (D) Particles

Ans. :

a. Molecules

Explanation:

Avogadro's hypothesis: All gases containing equal moles if substance occupy the same volume at the same temperature and pressure.

40. What will be the molarity of pure water?

(A) 18M. (B) 50.0M. (C) 55.6M. (D) 100M.

Ans. :

c. 55.6M.

41. A compound contains 69.5% oxygen, 30.5% nitrogen and its molecular weight is 92. The formula of compound is:

(A) N_2O (B) NO_2 (C) N_2O_4 (D) N_2O_5

Ans. :

c. N_2O_4

Explanation:

Element	%	% at. wt	Ratio
N	30.5	$\frac{30.5}{14} = 2.18$	1
O	69.5	$\frac{69.5}{16} = 4.34$	2

Empirical formula = NO_2

Empirical formula weight = 46

$n = \frac{92}{46} = 2$

⇒ Molecular formula = $(NO_2)_2 = N_2O_4$

42. X g of Ag was dissolved in HNO_3 and the solution was treated with excess of NaCl, when 2.87g of AgCl was precipitated. The value of x is:

(A) 1.08g. (B) 2.16g. (C) 2.70g. (D) 1.62g.

Ans. :

b. 2.16g.

43.

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

(A) 45.0g conc. HNO_3 (B) 90.0g conc. HNO_3

(C) 70.0g conc. HNO_3 (D) 54.0g conc. HNO_3

Ans. :

a. 45.0g conc. HNO_3

Explanation:

$\because$ Molarity

$= \frac{\text{Weight of } HNO_3}{\text{Molecular mass of } HNO_3 \times \text{Volume of solution (in L)}}$

$\therefore$ Weight of HNO_3

= Molarity × Molecular mass Volume (in L)

$= 2 \times 63 \times \frac{1}{4} = 31.5\text{g}$

It is the weight of 100% HNO_3

But the given acid is 70% HNO_3

$\therefore$ Its weight $= 31.5 \times \frac{100}{70}\text{g} = 45\text{g}.$

44. Who is called father of modern chemistry ?

(A) Antoine Lavoisier. (B) Gilbert Lewis.

(C) Gibbs. (D) Otto Hahn.

Ans. :

a. Antoine Lavoisier

Explanation:

Antoine Lavoisier is known as the father of modern chemistry.

45. A hydrocarbon was found to contain 75% by mass of carbon and 25% by mass of hydrogen. What is empirical formula of the compound?

(A) C_2H_4 (B) C_2H_6 (C) CH_4 (D) C_6H_6

Ans. :

c. CH_4

Explanation:

$\frac{75}{12} : \frac{25}{1}$

$\Rightarrow 6.25 : 25$

$\Rightarrow 1 : 4$

46. The mass of a sand and powdered mixture along with a beaker is 56g. If the mass of the dried mixture is 20g, find the % composition of the mixture in 100g?
(weight of beaker = 20g).

(A) 20% (B) 36% (C) 55% (D) 60%

Ans. :

c. 55%

Explanation:

Mass of beaker = 20g

Mass of mixture + beaker = 56g

Mass of mixture = 56 - 20 = 36g

Mass of washed and dried sand = 20g

100g of mixture contains $= \frac{20}{36} \times 100 = 55\%$ of sand.

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

(A) 1.5M (B) 1.66M (C) 0.017M (D) 1.59M

Ans. :

b. 1.66M

Explanation

If 500ml of solution is diluted to 1500ml of solution.

The morality can be calculated by the formula $M_1V_1 = M_2V_2$

Whereas $M_1 = 5M$, $V_1 = 500$, $V_2 = 1500$, $M_2 =?$

Here we have to find M_2.

By pitting values in the formula

$5 \times 500 = 1500 \times M_2$

$M_2 = \frac{2500}{1500}$

= 1.66M

Hence the morality is 1.66M

48. An organic compound containing C and H has 92.3% of carbon, its empirical formula is:

(A) CH (B) CH_3 (C) CH_2 (D) CH_4

Ans. :

a. CH

Explanation:

Element	%	% atomic weight	Simplest ratio
C	92.3	$\frac{92.3}{12} = 7.69$	$\frac{7.69}{7.69} = 1$
H	7.7	$\frac{7.7}{1} = 7.70$	$\frac{7.70}{7.69} = 1$

∴ Empirical formula = CH

49. 1u= ?

(A) The mass of one atom of the carbon -12 isotope

(B) $\frac{1}{12}^{\text{th}}$ the mass of one atom of the carbon -16 isotope

(C) $\frac{1}{12}^{\text{th}}$ the mass of one atom of the carbon -12 isotope

(D) The mass of one atom of the carbon -16 isotope

Ans. :

c. $\frac{1}{12}^{\text{th}}$ the mass of one atom of the carbon -12 isotope

Explanation:

1u = $\frac{1}{12}^{\text{th}}$ the mass of one atom of the carbon -12 isotope.

50. A compound was found to contain 5.37% nitrogen. What is the minimum molecular weight of compound ?

(A) 26.07 (B) 2.607

(C) 260.7 (D) None of these

Ans. :

c. 260.7

Explanation:

5.37g of N in 100g compound.

$14\text{gN} = \frac{100 \times 14}{5.37} = 260.7\text{g compound}$

Which is the minimum molecular wt as it should have at least one N.

51. What is % composition of a substance?

(A) Sum of all the components.

(B) % composition of the sum of two components.

(C) % of the total mass of a substance.

(D) None of the above.

Ans. :

c. % of the total mass of a substance.

Explanation:

The percent composition of a component in a compound is the percent of the total mass of the compound that is due to that component.

52. The matter is neither created nor destroyed during any physical or chemical change. This statement is of the:

(A) Law of constant proportion. (B) Law of conservation of mass.

(C) Law of reciprocal proportion. (D) Law of multiple proportion.

Ans. :

b. Law of conservation of mass.

Explanation:

The law of conservation of mass states that "the matter is neither created nor destroyed during any physical or chemical change".

The Law of conservation of Mass states that matter can be changed from one form into another, mixtures can be separated or made, and pure substances can be decomposed, but the total amount of mass remains constant. The total mass of the universe is constant within measurable limits.

53. $Na_2SO_3 \cdot xH_2O$ has 50% H_2O by mass. Hence, x is:

(A) 4 (B) 5 (C) 6 (D) 7

Ans. :

d. 7

Explanation:

Molecular mass of $Na_2SO_3 \cdot xH_2O = 126 + 18x$

Hence, $\frac{18x}{126+18x} = 0.5(\text{given})$

$\therefore x = 7$

54. Addition of 6.65×10^4 and 8.95×10^3, in terms of scientific notation will be:

(A) 7.545×10^4 (B) 75.45×10^3 (C) 754.5×10^2 (D) 75.45×10^0

Ans. :

a. 7.545×10^4

55. What will be the molality of the solution containing 18.25g of HCl gas in 500g of water?

(A) 0.1m (B) 1M (C) 0.5m (D) 1m

Ans. :

d. 1m

Explanation:

$\text{Molility} = \frac{\text{No. of moles of solute}}{\text{Mass of solvent in kg}}$

$\text{no. of moles} = \frac{18.25}{36.5} = 0.5$

$\text{Molality} = \frac{0.5}{0.5} = 1\text{m}$

56. What is the mass of the solvent present in 200g of 25% (w/ W) calcium hydroxide solution?

(A) 150g (B) 125g (C) 175g (D) 100g

Ans. :

a. 150g

Explanation:

Given that Mass of solution = 200g and let mass of solute = x

Now, mass of the solute can be calculated as follow: $25 = \frac{x}{200} \times 100$

Thus, x = mass of solute = 50g

Therefore mass of solvent = mass of solution - mass of solute = 200 - 50 = 150g

57. When an inflated tyre bursts, the air escaping out will:

(A) Get heated up (B) Be cooled

(C) Not undergo any change in its temperature (D) Be liquified

Ans. :

b. Be cooled

58. India's uranium supply comes mainly from the Jaduguda mines in:

(A) Bihar (B) Madhya Pradesh

(C) Maharashtra (D) None of these

Ans. :

d. None of these

59. Who performed the gold foil experiment?

(A) Thomson (B) Goldstein (C) Chadwick (D) Rutherford

Ans. :

a. Rutherford

Explanation:

Rutherford's Gold foil experiment proved the existence of a small massive centre to atoms, which was later known as the nucleus of an atom.

Ernest Rutherford, Hans Geiger and Ernest Marsden carried out their Gold foil experiment to observe the effect of alpha particles on the matter.

60. 800 g of a 40% solution by weight was cooled. 100g of solute was precipitated. The percentage composition of remaining solution is:

(A) 31.4% (B) 20.0% (C) 23.0% (D) 24%

Ans. :

a. 31.4%

Explanation:

Solutepresentin800gsolution$= 800 \times \frac{40}{100} = 320\text{g}$

Soluteprecipitated = 100g

Soluteleft = 220g

$\therefore$ Totalweightofsolution = 800 − 100 = 700g

700g solution has solute = 220

100g solution has solute $= \frac{220}{700} \times 100 = 31.43\%$

61. What will be the ratio of Cl^{35} and Cl^{37} respectively in ordinary chlorine if the atomic weight of chlorine is 35.5

(A) 1 : 3 (B) 3 : 1 (C) 1 : 2 (D) 2 : 1

Ans. :

b. 3 : 1

Explanation:

Using average molcular mass formula:

x(35) + (1−x) (37) = 35.5

x = 0.75

1 − x = 0.25

$\frac{0.75}{0.25} = 3 : 1$

62. What is the percentage by weight of sulphuric acid if 13g of H_2SO_4 is dissolved to make 78g of solution?

(A) 13.2% (B) 14.28% (C) 20% (D) 16.6%

Ans. :

d. 16.6%

Explanation:

Weight of sulphuric acid = 13g

Weight of solution = 78g

$\therefore \frac{\text{w}}{\text{W}}\% = \frac{13}{78} \times 100 = 16.6\%$

63. Which of the following expression of concentration of a solution is independent of temperature?

(A) Molarity (B) Normality (C) Formality (D) Molality

Ans. :

d. Molality

Explanation:

$$\text{Molality} = \frac{\text{number of moles of solute}}{\text{mass of solvent in kilograms}}$$

Since mass is unaffected by the change in temperature, hence molality is independent of temperature.

64.

A solution is prepared by dissolving 5.64g of glucose in 60g of water. Calculate the mass percent of glucose.

(A) 8.59% (B) 6.85% (C) 9.34% (D) 3.59%

Ans. :

a. 8.59%

Explanation:

$$\text{Mass percent of glucose} = \frac{\text{mass of glucose}}{\text{mass of solutio}} \times 100$$

$$= \frac{5.64}{(5.64+60)} \times 100$$

65. A certain metal sulphide, MS_2, is used extensively as a high temperature lubricant. If MS_2 is 40.06% by mass of sulphur, metal M has atomic mass:

(A) 160amu (B) 64amu (C) 40amu (D) 96amu

Ans. :

d. 96amu

Explanation:

Molecular weight of MS_2 = 2S + M

$$\frac{64}{\text{M}+64} = 0.4006$$

$$\therefore \text{M} = 96$$

66. If $3.01 \times 10_{20}$ molecules are removed from 98 mg of H_2SO_4, then number of moles of H_2SO_4 left are:

(A) 0.5×10^{-3}mol. (B) 0.1×10^{-3}mol.

(C) 9.95×10^{-3}mol. (D) 1.66×10^{-3}mol.

Ans. :

a. 0.5×10^{-3}mol.

Explanation:

Number of moles H_2SO_4 in 98g of H_2SO_4

$$= \frac{98 \times 10^{-3}\text{g}}{98} = 10^{-3}\text{moles}$$

Number of moles H_2SO_4 removed

$$= \frac{3.01 \times 10^{20}}{6.02 \times 10^{23}} = \frac{1}{2} \times 10^{-3}$$

$$= 0.5 \times 10^{-3}\text{mol}$$

Number of moles H_2SO_4 left

$= 1 \times 10^{-3} - 0.5 \times 10^{-3} = 0.5 \times 10^{-3}$ moles.

67. Avogadro's law finds an application in the determination of:

(A) Atomicity of gas. (B) Molecular weights of gases.

(C) Molecular formula of certain gaseous compoun. (D) All the above.

Ans. :

b. Molecular weights of gases.

Explanation:

Avogadro's law finds an application in the determination of molecular weights of gases.

*** a statement of Assertion (A) is followed by a statement of Reason (R). [2]**

Choose the correct option.

68. **Note:** In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

Assertion (A): One atomic mass unit is defined as one twelfth of the mass of one carbon-12 atom.

Reason (R): Carbon-12 isotope is the most abundunt isotope of carbon and has been chosen as standard.

i. Both A and R are true and R is the correct explanation of A.
ii. Both A and R are true but R is not the correct explanation of A.
iii. A is true but R is false.
iv. Both A and R are false.

Ans. :

ii. Both A and R are true but R is not the correct explanation of A.

Explanation:

$$1\text{a mu} = \frac{1}{12} \times \text{Mass of one} C^{12} \text{Atom} \Big| C^{12}$$

Isotope is considered as standard for defining the atomic and molecular mass.

69. **Note:** In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

Assertion (A): Combustion of 16g of methane gives 18g of water.

Reason (R): In the combustion of methane, water is one of the products.

i. Both A and R are true but R is not the correct explanation of A.
ii. A is true but R is false.
iii. A is false but R is true.
iv. Both A and R are false.

Ans. :

iii. A is false but R is true.

Explanation:

$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

16g of CH_4 on complete combustion will give 36g of water

*** Answer The Following Questions In One Sentence.[1 Marks Each] [4]**

70. Dinitrogen and dihydrogen react with each other to produce ammonia according to the following chemical equation:

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

Will any of the two reactants remain unreacted?

Ans. : N_2 is the limiting reagent and H_2 is the excess reagent.

Hence, H_2 will remain unreacted.

71. How many significant figures are present in the following?

5005

Ans. : 5005

There are 4 significant figures.

72. A substance has molecular formula $C_6H_{12}O_6$. What is its empirical formula?

Ans. : CH_2O is empirical formula.

73. Boron occurs in nature in the form of two isotopes, $^{11}_{5}\mathrm{B}$ and $^{10}_{5}\mathrm{B}$, in ratio of 81% and 19% respectively. Calculate its average atomic mass.

Ans. : Average atomic mass $= \frac{11\times81+10\times19}{100} = 10.81$

*** Given Section consists of questions of 2 marks each.** **[8]**

74. A sample of drinking water was found to be severely contaminated with chloroform, $CHCl_3$, supposed to be carcinogenic in nature. The level of contamination was 15ppm (by mass).
Determine the molality of chloroform in the water sample.

Ans. : 100g of the sample contains 1.5×10^{-3}g of $CHCl_3$.

⇒ 1000g of the sample contains 1.5×10^{-2}g of $CHCl_3$.

∴ Molality of chloroform in water

$= \frac{1.5\times10^{-1}\mathrm{g}}{\text{Molar mass of } CHCl_3}$

$= 1.5 \times 10^{-3}\%$

Molar mass of $CHCl_3$ = 12.00 + 1.00 + 3(35.5)

= 119.5g mol^{-1}

∴ Molality of chloroform in water = 0.0125×10^{-2}m

= 1.25×10^{-4}m

75. A sample of drinking water was found to be severely contaminated with chloroform, $CHCl_3$, supposed to be carcinogenic in nature. The level of contamination was 15ppm (by mass).
Express this in percent by mass.

Ans. : 1ppm is equivalent to 1 part out of 1 million (10^6) parts.

∴ Mass percent of 15ppm chloroform in water

$= \frac{15}{10^6} \times 100$

$= 1.5 \times 10^{-3}\%$

76. Calculate the average atomic mass of hydrogen using the following data:

Isotope	% Natural abundance	Molar mass
^1H	99.985	1
^2H	0.015	2

Ans. : Average atomic mass

$= \frac{\text{Abundance of } ^1\mathrm{H}\times\text{Atimic mass} + \text{Abudance of } ^2\mathrm{H}\times\text{Atomic mass}}{100}$

$= \frac{99.985\times1+0.015\times2}{100} = \frac{100.015}{100} = 1.00015\mathrm{u}$

77. How much copper can be obtained from 100g of copper sulphate ($CuSO_4$)?

Ans. : Molar mass of $CuSO_4$ = 63.54 + 32.06 + (4 × 16) = 159.6g mol^{-1}

159.6g $CuSO_4$ contains = 63.54g Cu

1g $CuSO_4$ contains $= \frac{63.54}{159.6} \text{g Cu}$

$\therefore$ 100g $CuSO_4$ contains $= \frac{63.54 \times 100}{159.6}$

$= 39.81 \text{g Cu.}$

*** Given Section consists of questions of 3 marks each.** **[9]**

78. Calculate the mass of sodium acetate (CH_3COONa) required to make 500mL of 0.375 molar aqueous solution. Molar mass of sodium acetate is 82.0245 g mol^{-1}.

Ans. : 0.375 M aqueous solution means that 1000ml of the solution contain sodium acetate = 0.375 mole.

$\therefore$ 500ml of the solution contain sodium acetate $= \frac{0.375}{2}$ mole

Molar mass of sodium acetate = 82.0245g mol-1

$\therefore$ Mass of sodium acetate required $= \frac{0.375}{2}$ mole, × 82.0245g mol-1 = -15.380g.

79. Two oxides of a metal contain 27.6% and 30.0% of oxygen respectively. If the formula of the first oxide is M_3O_4, find that of the second.

Ans. : In the first oxide, oxygen = 27.6

Metal = 100 - 27.6 = 72.4 parts by mass.

As the formula of the oxide is M_3O_4, it means

72.4 parts by mass of metal = 3 atoms of metal and

4 atoms of oxygen = 27.6 parts by mass.

In the second oxide, oxygen = 30.0 parts by mass and metal = 100 - 30 = 70 parts by mass.

But 72.4 parts by mass of metal = 3 atoms of metal.

$\therefore$ 70 parts by mass of metal $= \frac{3}{72.4} \times 70$ atoms of metal = 2.90 atoms of metal

Also, 27.6 part by mass of oxygen = 4 atoms of oxygen.

$\therefore$ 30 part by mass of oxygen $= \frac{4}{27.6} \times 30$ atoms of oxygen

= 4.35 atoms of oxygen.

Hence, ratio of M : O in the second oxide = 2.90 : 4.35 = 1 : 1.5 or 2 : 3

$\therefore$ Formula of the other metal oxide is M_2O_3.

80. For precious stone, carat is used for specifying its mass. If 1 carat = 3.08647 grains (a unit of mass) and 1 gram = 15.4324 grains. Find the total mass in kilogram of a ring that contains 0.700 carat diamond and 5.00 gram gold.

Ans. : Finding mass of diamond in kg

1 carat = 3.08647 grains

$\therefore$ 0.700 carat = 0.700 × 3.08647 grains = 2.16 grains

Also, 1 gram = 15.4324 grains

$\therefore 1 \text{grain} = \frac{1}{15.4324} = 0.064799 \text{ grams.}$

and 2.16 grains = 216 × 0.064799 = 0.1399 grams

1 gram = 10^{-3}/ g

⇒ 0.1399g = 1.399×10^{-2}kg

Total mass of the ring in kg

= 1.399×10^{-2} kg + 5×10^{-3}kg = 1.899×10^{-2}kg.

*** Given Section consists of questions of 5 marks each.** **[30]**

81. Calculate the atomic mass (average) of chlorine using the following data:

	% Natural Abundance	Molar Mass
^{35}Cl	75.77	34.9689
^{37}Cl	24.23	36.9659

Ans. : The average atomic mass of chlorine

$$= \left[\begin{pmatrix} \text{Fractional abundance} \\ \text{of } {}^{35}\text{C1} \end{pmatrix} \begin{pmatrix} \text{Molar mass} \\ \text{of } {}^{35}\text{C1} \end{pmatrix} + \begin{pmatrix} \text{Fractional abundance} \\ \text{of } {}^{35}\text{C1} \end{pmatrix} \begin{pmatrix} \text{Molar mass} \\ \text{of } {}^{35}\text{C1} \end{pmatrix} \right]$$

$$= \left[\left\{ \left(\frac{75.77}{100} \right) (34.9689) \right\} + = \left[\left\{ \left(\frac{24.23}{100} \right) (36.9659) \right\} \right] \right.$$

$$= 26.4959 + 8.9568$$

$$= 35.4527\text{u}$$

∴ The average atomic mass of chlorine = 35.4527u.

82. What is the concentration of sugar ($C_{12}H_{22}O_{11}$) in mol L^{-1} if its 20g are dissolved in enough water to make a final volume up to 2L?

Ans. : Molarity (M) of a solution is given by,

$$= \frac{\text{Number of moles of solute}}{\text{Volume of solution in Litres}}$$

$$= \frac{\text{Mass of suger/molar mass of sugar}}{2\text{L}}$$

$$= \frac{20\text{g}/[(12\times12)+(1\times22)+(11\times16)]\text{g}}{2\text{L}}$$

$$= \frac{20\text{g}/342\text{g}}{2\text{L}}$$

$$= \frac{0.0585 \text{ mol}}{2\text{L}}$$

$$= 0.02925 \text{ mol L}^{-1}$$

∴ Molar concentration of sugar = 0.02925 mol L^{-1}

83. If the density of methanol is 0.793kg L^{-1}, what is its volume needed for making 2.5L of its 0.25M solution?

Ans. : Molar mass of methanol (CH_3OH) = (1 × 12) + (4 × 1) + (1 × 16)

= 32 g mol^{-1}

= 0.032 kg mol^{-1}

Molarity of methanol solution $= \frac{0.793\text{kg L}^{-1}}{0.032\text{kg mol}^{-1}}$

= 24.78 mol L^{-1}

(Since density is mass per unit volume)

Applying,

$M_1V_1 = M_2V_2$

(Given solution) (Solution to be prepared)

$(24.78 \text{ mol } L^{-1}) V_1 = (2.5 \text{ L}) (0.25 \text{ mol } L^{-1})$

$V_1 = 0.0252L$

$V_1 = 25.22mL$

84. Calcium carbonate reacts with aqueous HCl to give $CaCl_2$ and CO_2 according to the reaction, $CaCO_{3(s)} + 2\ HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$
What mass of $CaCO_3$ is required to react completely with 25mL of 0.75M HCl?

Ans. : 0.75M of HCl ≡ 0.75mol of HCl are present in 1L of water

≡ [(0.75mol) × (36.5g mol^{-1})] HCl is present in 1L of water

≡ 27.375g of HCl is present in 1L of water

Thus, 1000mL of solution contains 27.375g of HCl.

∴ Amount of HCl present in 25mL of solution

$= \frac{27.375\text{g}}{1000\text{mL}} \times 25\text{mL}$

$= 0.6844\text{g}$

From the given chemical equation,

$CaCO_{3(s)} + 2\ HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$

2mol of HCl (2 × 36.5 = 73g) react with 1 mol of $CaCO_3$ (100g).

∴ Amount of $CaCO_3$ that will react with 0.6844g,

= 100/73 × 0.684410073 × 0.6844

= 0.9375g

85. A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38g carbon dioxide, 0.690 g of water and no other products. A volume of 10.0L (measured at STP) of this welding gas is found to weigh 11.6g. Calculate.

i. Empirical formula.
ii. Molar mass of the gas.
iii. Molecular formula.

Ans. : Amount of carbon in 3.38g $\text{CO}_2 = \frac{12}{44} \times 3.38\text{g} = 0.9218\text{g}$

Amount of hydrogen in 0.690g $\text{H}_2\text{O} = \frac{2}{18} \times 0.690\text{g} = 0.0767\text{g}$

As compound only C and H,

Therefore, total mass of the compound,

= 0.9218 +0.0767g = 0.9985g

% of C in the compound $= \frac{0.9218}{0.9985} \times 100 = 92.32$

% of H in the compound $= \frac{0.0767}{0.9985} \times 100 = 7.68$

Calculation of Empirical Formula.

Element	% by mass	Atomic mass	Moles of the element	Simplest molar ratio	Simplest whole no. molar ratio
C	92.32	12	$\frac{92.32}{12} = 7.69$	1	1
H	7.68	1	$\frac{7.68}{1} = 7.68$	1	1

$\therefore$ Empirical formula = CH

10.0L of the gas at STP weight = 11.6g

$\therefore$ 22.4L of the gas at S.T.P. will weight $= \frac{11.6}{10.0} \times 22.4 = 25.984\text{g} \approx 26\text{g}$

$\therefore$ Moral mass = 26g mol^{-1}

Emprirical formula mass of CH = 12 + 1 = 13

$\therefore \text{n} = \frac{\text{Molecular mass}}{\text{E.F. mass}}$

$\therefore \text{Molecular formula } = 2 \times \text{CH} = \text{C}_2\text{H}_2$

86. What volume of 0.1 M NaOH solution is required to neutralise 100ml of concentrated aqueous sulphuric acid which contains 98% H_2SO_4 by mass. The density of concentrated sulphuric acid solution is 1.84g ml^{-1} NaOH reacts with H_2SO_4 according to the following reaction:

$2NaOH + H_2SO4 \rightarrow Na_2SO_4 + 2H_2O$

(Atomic mass/ g mol^{-1} H = 1, S = 32, O = 16).

Ans. :

$$\text{Molarity} = \frac{\text{Number of moles of solute}}{\text{Litre of solution}}$$

$$= \frac{\text{Mass of solute}\left(\text{W}_\text{B}\right)}{\text{Molar mass of solute}\left(\text{M}_\text{B}\right)} \times \frac{1000}{\text{Volume of solution in mL}}$$

$$= \frac{\text{Mass of solute}\left(\text{W}_\text{B}\right)}{\text{Molar mass of solute}\left(\text{M}_\text{B}\right)} \times \frac{1000}{\frac{\text{Volume of solution}}{\text{Density of solution}}}$$

$$= \frac{98}{98} \times \frac{1000}{\frac{\text{Volume of solution}}{\text{Density of solution}}}$$

$$= \frac{98}{98} \times \frac{1000}{\frac{100}{1.84}} = 18.4\text{M}$$

$$= \frac{98}{98} \times \frac{1000}{100} \times 1.84$$

$$2(\text{M}_1\text{V}_1)_{\text{H}_2\text{SO}_4} = (\text{M}_2\text{V}_2)_{\text{NaOH}}$$

$$\Rightarrow 2 \times 18.4\text{M} \times 100\text{ml} = 0.1\text{M} \times \text{V}_2$$

$$\Rightarrow \text{V}_2 = \frac{2 \times 18.4 \times 100}{0.1}$$

$$= 36.80 \times 10^3\text{ml} = 36.8\text{L}.$$

----- अगर आप सूरज की तरह चमकना चाहते हो, तो सूरज की तरह जलना सीखो। ... -----