Some basic concepts of Chemistry Questions with Solutions

Q1. Which carbon isotope is used in obtaining relative atomic masses?

(a) Carbon-12
(b) Carbon-13
(c) Carbon-14
(d) None of the above

Answer: (a), The carbon-12 isotope is used to obtain relative atomic masses.

Q2. What is the relation between the molar mass and the vapour density of a gas?

(a) Molar mass = Vapour density / 2
(b) Molar mass = 2 × Vapour density
(c) Molar mass = Vapour density
(d) No relation

Answer: (b), Molar mass = 2 × Vapour density.

Q3. How many significant figures are there in 7070×10^7?

(a) Two
(b) Four
(c) Seven
(d) Can't be determined

Answer: There are four significant figures in 7070×10^7.

Q4. What do you mean by the term significant figure?

Answer: Significant figures refers to the digits that carry a meaning towards the resolution of the measurement.

For example, 3600 has two significant figures. In contrast, 36.00 has four significant figures.

Q5. What is gay lussac's law of combining volumes?

Answer: The gay lussac's law of combining volumes states that the relative volumes of gases are in the ratio of small whole numbers at constant temperature and pressure.

Q6. What is the volume of $6.022 \text{ X } 10^{23}$ molecules of hydrogen at NTP?

(a) 22.4 litres
(b) 11.2 litres
(c) 1 litre
(d) 2 litres

Answer: (a), $6.022 \text{ X } 10^{23}$ molecules of hydrogen contain 22.4 litres of hydrogen.

Q7. What is the molarity of a solution containing 5.85 g of NaCl(s) in a 500 mL solution?
Answer: Given
Mass of solute = 5.85 g
Volume of solution 500 ml
Molar mass of NaCl = 23 + 35.5 = 58.5
No. of moles of solute = Mass of solute / Molar mass of solute
No. of moles of solute = 5.85 / 58.5
No. of moles of solute = 0.1
Molarity = No. of the mole of solute / Volume of solution
Molarity = 0.1 / 0.5 = 0.2 mol / L

Q8. What is the mass of one atom of C-12 (in grams)?
Answer: Mass of 1 mole of C-12 atoms = 12 g
1 mole of C-12 atoms contains 6.022×10^{23} atoms.
Thus, the mass of one atom of C-12 will be = $12 / (6.022 \times 10^{23})$.
Mass of one atom of C-12 = $1.99 \text{ X } 10^{-23}$ g

Q9. What is the law of multiple proportions?
Answer: Law of multiple proportions was given by English chemist John Dalton. He states that when two elements combine to form one or more compounds. Then the weight of one element that combines with the fixed weight of other elements is in the small whole-number ratio.

Q10. What are the postulates of dalton's atomic theory?
Answer: The postulates of dalton's atomic theory are mentioned below.

- He states that the atom is indivisible, i.e. we can not further subdivide it.
- He states that all atoms of the same element are identical.
- He states that different elements have different types of atoms.
- Compounds are formed when atoms of different elements join in a simple whole-number ratio.

Q11. What are the demerits of dalton's atomic theory?
Answer: The demerits of dalton's atomic theory are mentioned below.

- He states that an atom is indivisible, but we can further sub-divide the atom into electron protons and neutrons.
- He states that atoms of different elements combine in a simple whole-number ratio, but this concept failed to explain sugar molecule combination ($C_{12}H_{22}O_{11}$).
- He failed to explain the existence of isotopes, isobars and allotropes.

Q12. Match the following.

Column I	Column II

1 mol of any gas	3 mol
88 g of CO_2	1 mol
5.6 litres of O_2 at STP	0.25 mol
6.022 x 10^{23} molecules of H_2O	2 mol
96 g of O	6.022 X 10^{23} molecules

Answer:

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96 g of O	3 mol

Q13. What are the differences between molarity and molality?

Answer:

S. No.	Molarity	Normality
1.	Molarity is the number of moles of compound present in 1 litre of solution.	Molality is the number of moles of solute present in 1 kilogram of a solvent.
2.	Its unit is mol / L.	Its unit is mol / kg.
3.	It is dependent on the temperature, volume and solubility of the solute.	It depends on the mass and is independent of temperature and volume.

Q14. What are the differences between molarity and normality?

Answer:

S. No.	Molarity	Normality
1.	Molarity is the number of moles of compound present in 1 litre of solution.	Normality is the gram equivalent of solute present in 1 litre of solution.

2.	Its unit is mol / L.	Its unit is eq / L or meq / L.
3.	It does not depend on the type of reaction the solute undergoes.	It depends on the kind of reaction the solute undergoes.
4.	It is dependent on the temperature, volume and solubility of the solute.	It is dependent on reactive species present in the solution.

Q15. Match the following physical quantities with their corresponding units.

Column I	Column II
Luminous intensity	mol / L
Mole	kg
Pressure	Unitless
Mole fraction	Pascal
Mass	mol
Molarity	Candela

Answer:

Column I	Column II
Luminous intensity	Candela
Mole	mol
Pressure	Pascal
Mole fraction	Unitless
Mass	kg
Molarity	mol / L

Practise Questions on Some basic concepts of Chemistry

Q1. What are the rules for writing significant figures?
Answer: To determine the significant figures we use the following rules.

- Non-Zero digits are always significant.
- Any zeroes between two significant figures are considered a significant figure.
- A final zero or trailing zeros in the decimal portion are only significant.

Example: 0.007 has one significant figure. In contrast, 0.700 has three significant figures.

Q2. If 4 litres of water are added to 2 litres of 6M hydrochloric acid solution. What will be the change in the molarity of the solution?
Answer: Let the initial volume of solution be V_1 = 2 litres
And final volume V_2 = 4 litres + 2 litres = 6 litres
Given Initial Molarity, M_1 = 6 M
Let the final molarity be M_2.
Using the following relationship, $M_1 V_1 = M_2 V_2$
6 M X 2 L = M_2 X 6 L
M_2 = 2 M
Hence, the molarity of the final solution would be 2 M.

Q3. How much lime would be obtained by heating 200 kg of 95% limestone?
Answer: 100 kg impure sample has pure 95% CaCO3 or 95 g CaCO3.
Therefore, a 200kg impure sample has 95 X 2 g pure CaCO3 = 190 g pure CaCO3
From the reaction given below:
CaCO3 → CaO + CO2
We can observe that 100kg CaCO3 will give 56 kg CaO.
Therefore, 190 kg CaCO3 will give 56 × 190 / 100 = 106.4 kg CaO

Q4. If a 500 mL 5 M solution is diluted to 1500 mL, what will be the molarity of the final solution?
Answer: Let the initial volume of solution be V_1 = 500 ml
And final volume V_2 = 1500 ml
Given Initial Molarity, M_1 = 5 M
Let the final molarity be M_2.
Using the following relationship, $M_1 V_1 = M_2 V_2$
5 M X 500 ml = M_2 X 1500 ml
M_2 = 1.66 M
Hence, the molarity of the final solution would be 1.66 M.

Q5. The molar mass and empirical formula of a compound are CH_2O and 180g. What will be its molecular formula?

Answer: Given Molar Mass = 180 g

Empirical Formula = CH_2O

Empirical Formula Mass = 12 + 2 + 16

Empirical Formula Mass = 30

N = Molar Mass / Empirical Formula Mass

N = 180 / 30

N = 6

Hence, its molecular formula would be $C_6H_{12}O_6$