CBSE Test Paper 04

Chapter 03 Atoms and Molecules

1. What weight of Calcium contains the same number of atoms as are present in 2 g of Sulphur? **(1)**
   a. 4 g
   b. 32 g
   c. 16 g
   d. 8 g
2. A student puts one big iron nail in a test tube containing solution of copper sulphate. He observed that after sometime **(1)**
   a. the solution turns light green
   b. the solution turns colourless
   c. the nail is unchanged
   d. the solution remains blue in colour
3. What according to Dalton's atomic theory is true among the following: **(1)**
   (a) Atom is divisible into protons, electrons and neutrons.
   (b) Atoms of the same element have different atomic masses.
   (c) Atoms are the ultimate indivisible particle of matter.
   (d) Atoms of the same element have same atomic masses, size and chemical properties.
   a. All of these
   b. (c) and (d) are correct
   c. (a) and (b) are correct
   d. (a), (b) and (c) are correct
4. An element A forms an oxide with formula A_2O_3. What is its valency? **(1)**
   a. 4
   b. 3
   c. 2
   d. 1
5. Which has more molecules - 4 g of methane or 11 g of CO_2? **(1)**
   a. Both have the same number of moles.

b. CO_2
c. Information not sufficient
d. Methane

6. Which postulate of Dalton's atomic theory is the basis of the law of conservation of mass? **(1)**
   a. Every matter is made up of small particles.
   b. Atoms are the smallest particles of matter.
   c. All of these
   d. Atoms can neither be created nor destroyed.

7. The valency of the of an element A is 4. Write the formula of its oxide. **(1)**

8. An element X has valency 3 while the element Y has valency 2. Write the formula of the compound between X and Y. **(1)**

9. State law of conservation of Mass? **(1)**

10. Which law of chemical combination deals with the composition of compound? **(1)**

11. Calculate the mass of one atom of hydrogen atom. **(3)**

12. Give three significance of mole. **(3)**

13. Which postulate of Dalton's atomic theory is the result of the law of conservation of mass? **(3)**

14. Calculate the ratio between the mass of one atom of hydrogen and mass of one atom of silver. **(5)**

15. 3.42 g of sucrose are dissolved in 18 g of water in a beaker. Find the number of oxygen atoms in the solution. **(5)**

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Answers

1. d. 8 g

   Explanation: Number of moles present in 2 g of Sulphur = 2/32 = 0.0625 moles. Atomic mass of Calcium is 40 u. Mass of Calcium containing 0.0625 moles of atoms = $0.0625 \times 40 = 8g$.

2. a. the solution turns light green

   Explanation: $Fe(s) + CuSO_4(aq) \rightarrow Cu(s) + FeSO_4(aq)$

   When an iron nail is dipped in copper sulphate solution, a brown coating of copper is formed on the surface of iron and the colour of copper sulphate solution changes from blue to light green.

3. b. (c) and (d) are correct

   Explanation: According Dalton's atomic theory, atoms are the ultimate indivisible particle of matter and atoms of the same element have same atomic masses, size and chemical properties.

4. b. 3

   Explanation: The formula of an ionic compound is formed by interchanging the valencies of the constituent atoms. Therefore, the valency of element A is 3 and that of element O is 2.

5. a. Both have the same number of moles.

   Explanation: 4 g of methane will contain 4/16 moles of molecules = 0.25 moles 11 g of CO_2 will contain 11/44 moles = 0.25 moles. Hence, both will contain an equal number of moles and an equal number of molecules.

6. d. Atoms can neither be created nor destroyed.

   Explanation: The basis of the Law of conservation of mass is the following postulate given by Dalton:- "Atoms can neither be created nor destroyed in a chemical reaction"

7. The formula of the oxide is A_2O_4 or AO_2.

8. The formula of the compound between X and Y is X_2Y_3.

9. According to the law of conservation of Mass, mass can neither be created nor be destroyed in a chemical reaction.The law of conservation of mass means that in a chemical reaction, the total mass of products is equal to the total mass of reactants. There is no change in mass during a chemical reaction.

10. Law of definite proportions.

11. We know that, 1 mole = Gram atomic mass = Avogadro's number

    Here, 1 mole of hydrogen atom = 1 g

    or 6.022×10^{23} atoms of hydrogen weigh = 1 g

    Mass of one atom = $\frac{1}{6.022\times10^{23}}$ g = 1.66058×10^{-24} g

12. (a) One mole of atoms of an element = Gram atomic mass of the element

    (b) One mole of atoms = 6.022×10^{23} atoms of the element.

    (c) Gram atomic mass = 6.022×10^{23} atoms of the element.

13. The postulate of Dalton's atomic theory which is the result of the law of conservation of mass is mentioned as below:

    Atoms are indivisible particles, which cannot be created or destroyed in a chemical reaction.

14. 1 mole of H atoms = 1 g

    1 mole of H atoms = 6.022×10^{23}atoms.

    Mass of 6.022×10^{23} atoms of H = 1 g

    Therefore, Mass of one atom of H = $\frac{1}{6.22\times10^{23}}g$

    = 1.66×10^{-24} g

    1 mole of silver atoms = 108 g

    1 mole of silver contains 6.022×10^{23} atoms

    Therefore, 6.022×10^{23}atoms of silver = 108 g

    Therefore, Mass of one atom or silver atom = $\frac{108}{6.022\times10^{23}}g$

$= 1.793 \times 10^{-22}$g

Ratio between masses of silver and hydrogen atoms = $\frac{1.793 \times 10^{-22} g}{1.66 \times 10^{-24} g}$

$= 1.080 \times 10^{2}$

15. Given, Mass of sucrose ($C_{12}H_{22}O_{11}$) =3.42 g

Molecular mass of sucrose ($C_{12}H_{22}O_{11}$) = 12 ×C + 22× H +11× O= 12 ×12+22× 1 +11 ×16 =144+22+176 =342 g /mol

Number of moles of sucrose = $\frac{Mass\ of\ Sucrose}{Molar\ mass\ of\ sucrose}$ = $\frac{3.42g}{342gmol^{-1}}$ = 0.01 mol

It is clear from formula of sucrose ($C_{12}H_{22}O_{11}$) ;

1 mol of sucrose ($C_{12}H_{22}O_{11}$) contains = 11 × N_A atoms of oxygen

0.01 mol of sucrose ($C_{12}H_{22}O_{11}$) contains = 0.01× 11 × N_A atoms of oxygen = 0.11 × N_A atoms of oxygen

Number of moles of water = $\frac{Mass\ of\ water}{Molecular\ mass\ of\ water}$ = $\frac{18g}{18gmol^{-1}}$ =1 mol

1 mol of water (H_2O) contains = 1 × N_A atom of oxygen

Total number of oxygen atoms = Number of oxygen atoms from sucrose + Number of oxygen atoms from water = 0.11 N_A + 1.0 N_A = 1.11 N_A

Therefore, Number of oxygen atoms in solution = 1.11 × Avogadro's number = 1.11 × 6.022 × 10^{23} = 6.68 × 10^{23} atoms.