CBSE Test Paper 02

Chapter 03 Atoms and Molecules

1. What information do we get from the molecular formula?
   (i) It represents one molecule of the substance.
   (ii) It does not tell the name of the substance.
   (iii) It tells about the type of atoms.
   (iv) It represents formula mass unit of the substance.

   a. (ii) and (iii) are correct
   b. All of these
   c. (i) and (ii) are correct
   d. (i), (iii) and (iv) are correct.

2. What is the atomicity of ammonia? **(1)**

   a. 0
   b. 4
   c. 2
   d. 3

3. Match the following with correct response: **(1)**

(1) A dozen of pencil	(A) Mole
(2) Avogadro constant	(B) 12
(3) Unit used for calculation of amount of chemical substances	(C) Carbon-12
(4) Reference atom	(D) 6.022×10^{23}

   a. 1-D, 2-A, 3-C, 4-B
   b. 1-C, 2-B, 3-D, 4-A
   c. 1-A, 2-C, 3-B, 4-D
   d. 1-B, 2-D, 3-A, 4-C

4. What is the ratio of magnesium and sulphur by mass in magnesium sulphide? **(1)**

a. 3:4
b. 23:35.5
c. 2:1
d. 5:2

5. A neutron is: **(1)**

   a. Chargeless and has no mass
   b. Has charge and no mass
   c. Charge-less and has mass
   d. Has charge and mass

6. What is the Latin name of Potassium? **(1)**

   a. None of these
   b. Ferrum
   c. Kalium
   d. Natrium

7. What is Dalton? **(1)**

8. What is the valency of calcium is $CaCO_3$? **(1)**

9. Give an example of a triatomic molecule of an element. **(1)**

10. Formula of the carbonate of a metal M is M_2CO_3. Write the formula of its chloride. **(1)**

11. What are isotopes? Name the isotopes of hydrogen and draw the structure of their atoms? **(3)**

12. Convert into mole. **(3)**

    1. 12 g of oxygen gas
    2. 20 g of water
    3. 22 g of carbon dioxide.

13. If one mole of carbon weighs 12 grams, what is the mass (in gram) of one atom of

carbon? **(3)**

14. Write the molecular formulae for the following compounds: **(5)**

    a. Copper (II) bromide
    b. Aluminium (III) nitrate
    c. Calcium (II) phosphate
    d. Iron (III) sulphide
    e. Mercury (II) chloride
    f. Magnesium (II) acetate

15. 0.44 g of a hydrocarbon on complete combustion with oxygen gave 0.88 g of carbon dioxide and 1.8 g water. Show that the results are in agreement with the law of conservation of mass. **(5)**

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Answers

1. d. (i), (iii) and (iv) are correct.

   Explanation: The molecular formula of a substance (an element or a compound) is a symbolic representation of the actual number of atoms present in one molecule of that substance. It represents formula mass unit of the substance. It also conveys the name of the substance. Therefore, (a), (c) and (d) are correct.

2. b. 4

   Explanation: The number of atoms present in one molecule of a substance is called its atomicity.

   Atomicity of Ammonia $\left(\mathrm{NH_3}\right)$ is 4 (1 atom of Nitrogen and 3 atoms of Hydrogen)

3. d. 1-B, 2-D, 3-A, 4-C

   Explanation:

(1) A dozen of pencil	(B) 12
(2) Avogadro constant	(D) 6.022×10^{23}
(3) Unit used for calculation of amount of chemical substances	(A) Mole
(4) Reference atom	(C) Carbon-12

4. a. 3**:**4

   Explanation: Atomic mass of magnesium is 24. Atomic mass of sulphur is 32. Therefore, the ratio of magnesium and sulphur by mass in magnesium sulphide (MgS) is 24:32 or 3:4

5. c. Charge-less and has mass

   Explanation: A neutron is a neutral sub-atomic particle and has mass. Mass of neutron is 1.0086654 u or 1.6749 x 10^{-27} kg.

6. c. Kalium

   Explanation: Latin name of Potassium element is Kalium from which symbol of Potassium is derived as K.

7. One u (unified mass) is also known as one Dalton.
   One atomic mass unit or unified mass (u) =$1.66 \times 10^{-27} kg$.

8. The valency of Ca in $CaCO_3$ is 2+(i.e. Ca^{2+}).

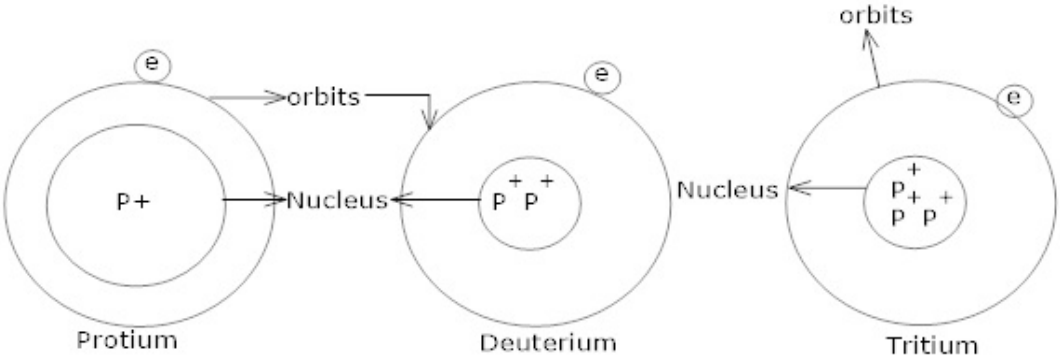
9. Ozone (O_3)

10. The valency of the metal (M) in M_2CO_3 is (2+) i.e. metal exists as M^{2+}. Therefore, the formula of metal chloride is MCl_2.

11. Isotopes are atoms of the same element having the same atomic number and different mass number. Isotopes of an element have the same atomic number because they contain the same no. of protons (and electrons). Isotopes of an element have different mass no. because they contain different no. of neutrons.
    There are 3 isotopes of hydrogen:-

    p^+ = Proton

    e^- = electron.



   i. Protium =.^1_1H Protium does not have a special symbol.
   ii. Deuterium =.^2_1H .The special symbol of deuterium is D.
   iii. Tritium = ^3_1H. The special symbol of tritium is T.

12. a. molecular mass of O_2 = 16×2 = 32u

    = 32 g (1 mole)

since 32 g of O_2=1 mole then 12 g of O_2

= $1 \times \frac{12}{32}$

=0.375 mole.

b. molecular mass of H_2O = 1×2+ 16 = 18 u

= 18 g (1 mole)

20 g H_2O = $1 \times \frac{20}{18}$ = 1.11 mole.

c. molecular mass of CO_2 = 12+16×2 = 12 + 32

= 44 u= 44 g (1 mole)

22 g of CO_2= $1 \times \frac{22}{44}$ = 0.5 mole.

13. Molar mass of carbon = 12 g

Now, 6.022×10^{23} atoms of carbon have mass = 12 g

∴ one atom of carbon has mass = (12 g) $\times \frac{(1atom)}{(6.022 \times 10^{23}\,\text{atoms})}$

= 1.99×10^{-23}g

14. a. The molecular formulae for the Copper (II) bromide:

Symbols: Cu Br

Valencies: 2 1

Cross over valencies

The molecular formulae for the Copper (II) bromide: Cu_1Br_2 or $CuBr_2$

b. The molecular formulae for the Aluminium (III) nitrate

Symbols: Al NO_3

Valencies: 3 1

Cross over valencies

The molecular formulae for the Aluminium (III) nitrate is $Al_1(NO_3)_3$ or $Al(NO_3)_3$

c. The molecular formulae for the Calcium (II) phosphate

Symbols: Ca PO_4

Valencies: 2 3

Cross over valencies

The molecular formulae for the Calcium (II) phosphate is $Ca_3(PO_4)_2$.

d. Fe_2S_3

e. $HgCl_2$

f. $Mg(CH_3COO)_2$

15. Hydrocarbon is a compound of carbon and hydrogen.
The amount of hydrocarbon reacted = 0.44 g.
Let us calculate the amount of carbon and hydrogen which are present in carbon dioxide and water respectively. These are the products.
Calculation of mass of carbon (C)
Mass of carbon dioxide (CO_2) formed = 0.88 g

CO_2 = C

for CO_2 = (12 + 2 $\times$ 16) = 44 g and for C = (1 $\times$ 12) = 12 g

Now, 44.0 g of carbon dioxide (CO_2) contain C = 12.0 g

0.88 g of carbon dioxide (CO_2) contain C

= $(12.0\text{g}) \times \frac{(0.88\text{g})}{(44.0\text{g})}$ = 0.24 g

Calculation of mass of hydrogen (H)
Mass of water (H_2O) formed = 1.8 g

H_2O = 2H

for H_2O = (2 $\times$ 1 + 16) = 18 g and for 2H = (2 $\times$ 1) = 2g

Now, 18 g of water (H_2O) contains H = 2.0 g

1.8 g of water (H_2O) contains H = $(2.0\text{g}) \times \frac{(1.8\text{g})}{(18.0\text{a})}$ = 0.20 g

Total mass of C and H in the products = (0.24 + 0.20) = 0.44 g
This mass comes out to be the same as the mass of the hydrocarbon. The data is in agreement with the law of conservation of mass.