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Lecture-07 by Alok Kumar

CLASS-IX

SUB-SCIENCE

Chapter -03

Atoms and Molecules

1. What is the number of water molecules contained in a drop of water weighing 0.06 g?

Solutions:-

Molecular mass of water H_2O

$$= 2 + 16$$

$$= 18 \text{ u}$$

1 mole of water has a mass of 18 grams and it contains 6.022×10^{23} molecules of water.

**18g water contains
= 6.022×10^{23} molecules**

**0.06g water contains=
 $6.022 \times 10^{23} \times 0.06 / 18$
= 2.007×10^{21} molecules**

Thus a drop of water weighing contains 2.007×10^{21} molecules.

2. calculate the mass of 3.011×10^{24} molecules of nitrogen (N_2)

Solutions:-

1 mole of $N_2 = 28$ g

**Mass of 6.022×10^{23}
molecules of nitrogen
molecules = 28 grams.**

**Mass of 3.011×10^{24}
molecules of N_2**

$$= 28 \times 3.011 \times 10^{24} / 6.022 \times 10^{23}$$

$$= 28 \times 10 / 2$$

$$= 140 \text{g}$$

3. calculate the mass of 1 mole of each one of the following:-

(a) NaCl (b) CaCO₃ (c) FeSO₄.7H₂O (d) Na₂O₂

Solution:-

(a) 1 mole of sodium chloride = formula mass of NaCl in grams

**= mass of Na+ mass of
Cl**

=23+35.5

=58.5g

**(b) 1 mole of calcium
carbonate**

**= formula mass of
CaCO₃ in grams**

**=Mass of Ca +Mass of C
+Mass of OX3**

=40+12++16X3

=100g

(c) 1 mole of

FeSO₄.7H₂O = Formula

mass of FeSO₄.7H₂O in

grams.

**=Mass of Fe+Mass of
S+Mass of Ox11+Mass
of H x14**

=56+32+16X11+1X14

=56+32+176+14

=278g

(d) 1 mole of Na₂O₂

=Formula mass of

**sodium peroxide in
grams**

**=Mass in Na_2O + Mass
of O_2**

= $23 \times 2 + 16 \times 2$

= $46 + 32$

= 78g

4. Calculate the number of aluminium ions present in 0.051 g of Aluminium Oxide (Al_2O_3) .

1 Mole of Aluminium oxide = formula mass of Al_2O_3 in grams

Mass of Al_2O_3 + mass of O_3

$$= 27 \times 2 + 16 \times 3$$

$$= 54 + 48$$

$$= 102 \text{g}$$

**1 mole of Aluminium
Oxide(Al_2O_3)contains
2moles of Al**

**Mass of Al in 1 mole of
 $\text{Al}_2\text{O}_3 = \text{Mass of Al} \times 2$**

$= 27 \times 2$

$= 54 \text{g}$

**102 g Aluminium Oxide
contains $= 54 \text{ g}$**

**0.051 g Aluminium
oxide contains**

$54 \times 0.051 / 102$

=0.027g Al

27 g of aluminium has

ions = 6.022×10^{23}

0.027g of aluminium

= $6.022 \times 10^{23} \times 0.027 / 27$

= 6.022×10^{20}

What you have learnt



What you have learnt

- During a chemical reaction, the sum of the masses of the reactants and products remains unchanged. This is known as the Law of Conservation of Mass.
- In a pure chemical compound, elements are always present in a definite proportion by mass. This is known as the Law of Definite Proportions.
- An atom is the smallest particle of the element that cannot usually exist independently and retain all its chemical properties.
- A molecule is the smallest particle of an element or a compound capable of independent existence under ordinary conditions. It shows all the properties of the substance.
- A chemical formula of a compound shows its constituent elements and the number of atoms of each combining element.
- Clusters of atoms that act as an ion are called polyatomic ions. They carry a fixed charge on them.
- The chemical formula of a molecular compound is determined by the valency of each element.
- In ionic compounds, the charge on each ion is used to determine the chemical formula of the compound.
- Scientists use the relative atomic mass scale to compare the masses of different atoms of elements. Atoms of carbon-12 isotopes are assigned a relative atomic mass of 12 and the relative masses of all other atoms are obtained by comparison with the mass of a carbon-12 atom.
- The Avogadro constant 6.022×10^{23} is defined as the number of atoms in exactly 12 g of carbon-12.
- The mole is the amount of substance that contains the same number of particles (atoms/ ions/ molecules/ formula units etc.) as there are atoms in exactly 12 g of carbon-12.
- Mass of 1 mole of a substance is called its molar mass.