

Vidya bhawan ,balika vidyapith

Subject- Chemistry

class- 9 A,B,C,D,E,F

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Atoms and molecules part (4)

1. Calculate the molecular masses of H_2 , O_2 , Cl_2 , CO_2 , CH_4 , C_2H_6 , C_2H_4 , NH_3 , CH_3OH .

Solution:

The following are the molecular masses:

The molecular mass of H_2 – 2 x atoms atomic mass of H = $2 \times 1u = 2u$

The molecular mass of O_2 – 2 x atoms atomic mass of O = $2 \times 16u = 32u$

The molecular mass of Cl_2 – 2 x atoms atomic mass of Cl = $2 \times 35.5u = 71u$

The molecular mass of CO_2 – atomic mass of C + 2 x atomic mass of O = $12 + (2 \times 16)u = 44u$

The molecular mass of CH_4 – atomic mass of C + 4 x atomic mass of H = $12 + (4 \times 1)u = 16u$

The molecular mass of C_2H_6 – 2 x atomic mass of C + 6 x atomic mass of H = $(2 \times 12) +$

$(6 \times 1)u=24+6=30u$

The molecular mass of C_2H_4 – 2 x atomic mass of C + 4 x atomic mass of H = $(2 \times 12) +$

$(4 \times 1)u=24+4=28u$

The molecular mass of NH_3 – atomic mass of N + 3 x atomic mass of H = $(14 + 3 \times 1)u= 17u$

The molecular mass of CH_3OH – atomic mass of C + 3x atomic mass of H + atomic mass of O + atomic mass of H = $(12 + 3 \times 1 + 16 + 1)u = (12 + 3 + 17)u = 32u$

2. Calculate the formula unit masses of ZnO, Na₂O, K₂CO₃, given atomic masses of Zn = 65u,

Na = 23 u, K=39u, C = 12u, and O=16u.

Solution:

Given:

Atomic mass of Zn = 65u

Atomic mass of Na = 23u

Atomic mass of K = 39u

Atomic mass of C = 12u

Atomic mass of O = 16u

The formula unit mass of ZnO = Atomic mass of Zn + Atomic mass of O = 65u + 16u = 81u

The formula unit mass of Na₂O = 2 x Atomic mass of Na + Atomic mass of O = (2 x 23)u + 16u = 46u + 16u = 62u

The formula unit mass of K₂CO₃ = 2 x Atomic mass of K + Atomic mass of C + 3 x Atomic mass of O = (2 x 39)u + 12u + (3 x 16)u = 78u + 12u + 48u = 138u

3. If one mole of carbon atoms weighs 12grams, what is the mass (in grams) of 1 atom of carbon?

Solution:

Given: 1 mole of carbon weighs 12g

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

Molecular mass of carbon atoms = 12g = an atom of carbon mass

Hence, mass of 1 carbon atom = $12 / 6.022 \times 10^{23} = 1.99 \times 10^{-23}$ g

4. Which has more number of atoms, 100 grams of sodium or 100 grams of iron (given, atomic mass of Na = 23u, Fe = 56 u)?

Solution:

Given: Atomic mass of Na=23u, Atomic mass of Fe= 56u

To calculate the number of atoms in 100g of sodium:

23g of Na contains = 6.022×10^{23} atoms

1g of Na contains = 6.022×10^{23} atoms / 23

100g of Na contains = 6.022×10^{23} atoms x 100 / 23
= 2.6182×10^{24} atoms

To calculate the number of atoms in 100g of sodium:

56g of Fe contains = 6.022×10^{23} atoms

1g of Fe contains = 6.022×10^{23} atoms / 56

100g of Fe contains = 6.022×10^{23} atoms x 100 / 56
= 1.075×10^{24} atoms

Hence, through comparison, it is evident that 100g of Na has more atoms.

By – soni kumari (chemistry)