

Chemistry Study Materials for Class 11 (NCERT Based Numericals of Chapter- 01)

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Some Basic Concept of Chemistry

Q. 32: It has been estimated that 93% of all atoms in the entire universe are hydrogen and that the vast majority of those remaining are helium. Based on only these two elements, estimate the mass percentage composition of the universe.

Solution: [Solution](#)

It is given that out of 100 atoms,

93 atoms are Hydrogen and 7 atoms are Helium.

Mass of Hydrogen atoms = $93 \times 1 = 93$

Mass of Helium atoms = $7 \times 4 = 28$

Therefore, Mass percentage of Hydrogen = $\frac{93}{93+28} \times 100$
 $= 76.86\%$

Mass percentage of Helium = $\frac{28}{93+28} \times 100$
 $= 23.14\%$.

Q. 33: The molecular weight of haemoglobin is about 65,000 g/mol. Haemoglobin contains 0.35% Fe by mass. How many iron atoms are there in a haemoglobin molecule?

Solution: [Solution](#)

Mass of Fe in haemoglobin = 0.35% of 65000

$$= \frac{0.35 \times 65000}{100}$$

$$= 227.5 \text{ g}$$

Therefore, No. of Fe atoms in a haemoglobin molecule = $\frac{227.5}{56}$
 $= 4$

Q.34: At room temperature, the density of water is 1.0 g/ml and the density of ethanol is 0.789 g/ml. What volume of ethanol contains the same number of molecules are present in 175 ml of water?

Solution: [Solution](#)

Let the volume of ethanol containing the same number of molecules as are present in 175mL of water be V ml.

Moles of C₂H₅OH in V ml = Moles of H₂O in 175 ml

Mass of C₂H₅OH /mol. = Mass of H₂O / mol.

Now, as Density=Mass / volume or Mass=Density × Volume

Therefore, $0.789 \times V = 1 \times 175$

$$V = 566.82 \text{ ml.}$$

Q. 35: Chlorophyll the green colouring matter of plants responsible for photosynthesis contains 2.68% of Magnesium by weight. Calculate the number of magnesium atoms in 4 g of Chlorophyll

Solution: [Solution](#)

Mass % of Mg = 2.68%

Now 100 g of Chlorophyll contains 2.68 g of Mg

Then 4 g of Chlorophyll contains = $(2.68 / 100) \times 4 = 0.1072 \text{ g}$

Now,

Number of atoms of Mg = $\frac{\text{Mass}}{\text{Molar mass}} \times 6.022 \times 10^{23}$

$$= 1.34 \times 10^{21} \text{ atoms}$$

Q. 36: Calculate approximately the diameter of an atom of mercury, assuming that each atom is occupying a cube of edge length equal to the diameter of the mercury atom. The density of mercury is 13.6 g/cc.

Solution:

Suppose the side of cube = x cm = diameter of mercury atom

Therefore, Volume of 1 Hg atom = x^3 and

Mass of 1 Hg atom = density × volume = $13.6 \times x^3$

Mass of 1 Hg atom = Atomic mass / Avogadro constant

$$= 200 / 6.022 \times 10^{23}$$

$$13.6 \times x^3 = 200 / 6.022 \times 10^{23}$$

$$x = (2.44 \times 10^{-23})^{1/3}$$

$$= 2.9 \times 10^{-8} \text{ cm.}$$
