

Answer on Question #46479 - Chemistry - Other

Question

the volume of the nucleus of a carbon atom is about 9.9×10^{-39} mL. The molar mass is 12,00 g mol⁻¹. What is the density of the carbon nucleus?

Answer:

The density equals:

$$\frac{m}{V}$$

m – the mass of a carbon nucleus, g;

V – the volume of the nucleus of a carbon atom, $V = 9.9 \times 10^{-39}$ mL.

Molar mass of the carbon means that 1 mol of carbon weighs 12.00 g. 1 mol of each substance contains 6.02×10^{23} particles, for carbon – 1 mol of carbon contains 6.02×10^{23} atoms. So, 1 carbon atom weighs:

$$m = \frac{12.00}{6.02 \times 10^{23}} = 1.99 \times 10^{-23} \text{ g}$$

As the mass of electrons is very tiny, the mass of the carbon nucleus is approximately equal to the mass of the whole carbon atom.

So, the density of the carbon nucleus is:

$$\frac{1.99 \times 10^{-23} \text{ g}}{9.9 \times 10^{-39} \text{ mL}} = 2.01 \times 10^{15} \text{ g/mL}$$

Answer: the density of the carbon nucleus is $2.01 \times 10^{15} \text{ g/mL}$.