Answer on Question #40831 - Chemistry – Inorganic Chemistry

Question

How many molecules are in 85 liters of $AgNO_3$?

How many cadmium atoms are there in 6.57x 10 to the 23rd power moles?

Please help with these two question need for a test.

Answer:

First question:

$AgNO_3$ is a solid, so there is no sense to measure its volume. For solids the main criteria is their mass. It looks like there is a mistake in first question. Two variants are possible: 85 grams of $AgNO_3$ or 85 liters of solution of $AgNO_3$. As we don't have a concentration value in this question, we assume that the question is "How many molecules are in 85 grams of $AgNO_3$?"

Number of moles of $AgNO_3$ equals:

$$n\,(AgNO_3) = \frac{m}{M}$$

m – Mass of $AgNO_3$, m = 85 g.

M – Molar mass of $AgNO_3$, g/mol:

$$M(AgNO_3) = M(Ag) + M(N) + 3M(O) = 108 + 14 + 3 \cdot 16 = 170\ g/mol$$

Then number of moles in 85 g of substance $AgNO_3$ equals:

$$n\,(AgNO_3) = \frac{85}{170} = \ 0.5\ mol$$

Number of molecules of $AgNO_3$ equals:

$$N = n(AgNO_3) \cdot N_A$$

N_A – the Avogadro constant, $N_A = 6.022 \cdot 10^{23}$.

$$N = 0.5 \cdot 6.022 \cdot 10^{23} = 3.011 \cdot 10^{23}$$

Second question:

Number of cadmium atoms equals:

$$N = n(Cd) \cdot N_A$$

n(Cd) – number of moles of cadmium, $n(Cd) = 6.57 \cdot 10^{23}$ mol.

N_A – the Avogadro constant, $N_A = 6.022 \cdot 10^{23}$.

$$N = 6.57 \cdot 10^{23} \cdot 6.022 \cdot 10^{23} = 3.956 \cdot 10^{47}$$

Answer: $3.011 \cdot 10^{23}$ molecules of $AgNO_3$; $3.956 \cdot 10^{47}$ atoms of Cd.