What is the mass of 7.9×10^{15} atoms of nickel (Ni)? Answer in units of g

Solution

We are given:

$$N = 7.9 * 10^{15}$$

Amount of substance is defined as:

$$\nu = \frac{N}{N_A}$$

Where $N_A = 6.022 * 10^{23} \, mol^{-1}$ is Avogadro constant;

Thus:

$$\nu(Ni) = \frac{7.9 * 10^{15}}{6.022 * 10^{23}} = 1.311 * 10^{-8} \, mol$$

Mass related to amount of substance as:

$$m = Mr * \nu$$

Where Mr is molar mass;

For nickel:

$$Mr(Ni) = 58.7 \frac{g}{mol}$$

Thus:

$$m = 58.7 * \ 1.311 * 10^{-8} \approx \mathbf{7.7 * 10^{-7} \, g}$$

Answer: $\mathbf{7.7 * 10^{-7} \, g}$