(2.1) How many atoms of ^{235}U exist in 1 kg of uranium oxide, U_3O_8, made of natural uranium?

First we must define the Avogadro number, N_A

$$N_A := 6.022 \cdot 10^{23} \cdot mole^{-1}$$

Then we have to define the molecular weights of U, O, and U_3O_8 (appendix I):

$$Mw_u := 238.03 \cdot \frac{gm}{mole} \qquad Mw_o := 16.00 \cdot \frac{gm}{mole} \qquad Mw_{u3o8} := 3 \cdot Mw_u + 8 \cdot Mw_o$$

In natural uranium, the atomic fraction of ^{235}U (x) is 0.724% (Table 2.1), i.e.:

$$x := \frac{0.724}{100}$$

The total amount of uranium oxide (U_3O_8), m_U, is 1 kg:

$$m_U := 1 \cdot kg$$

Now we can calulate the number of ^{235}U atoms, N_U, in this amount of uranium oxide (remember 3 U per U_3O_8):

$$N_U := 3 \cdot \frac{m_U}{Mw_{u3o8}} \cdot x \cdot N_A \qquad N_U = 1.553 \cdot 10^{22} \quad \text{atoms}$$